



APPENDIX J NOISE IMPACT ASSESSMENT



Garoo Solar Farm and Battery Energy Storage System

Noise Impact Assessment

PREPARED FOR

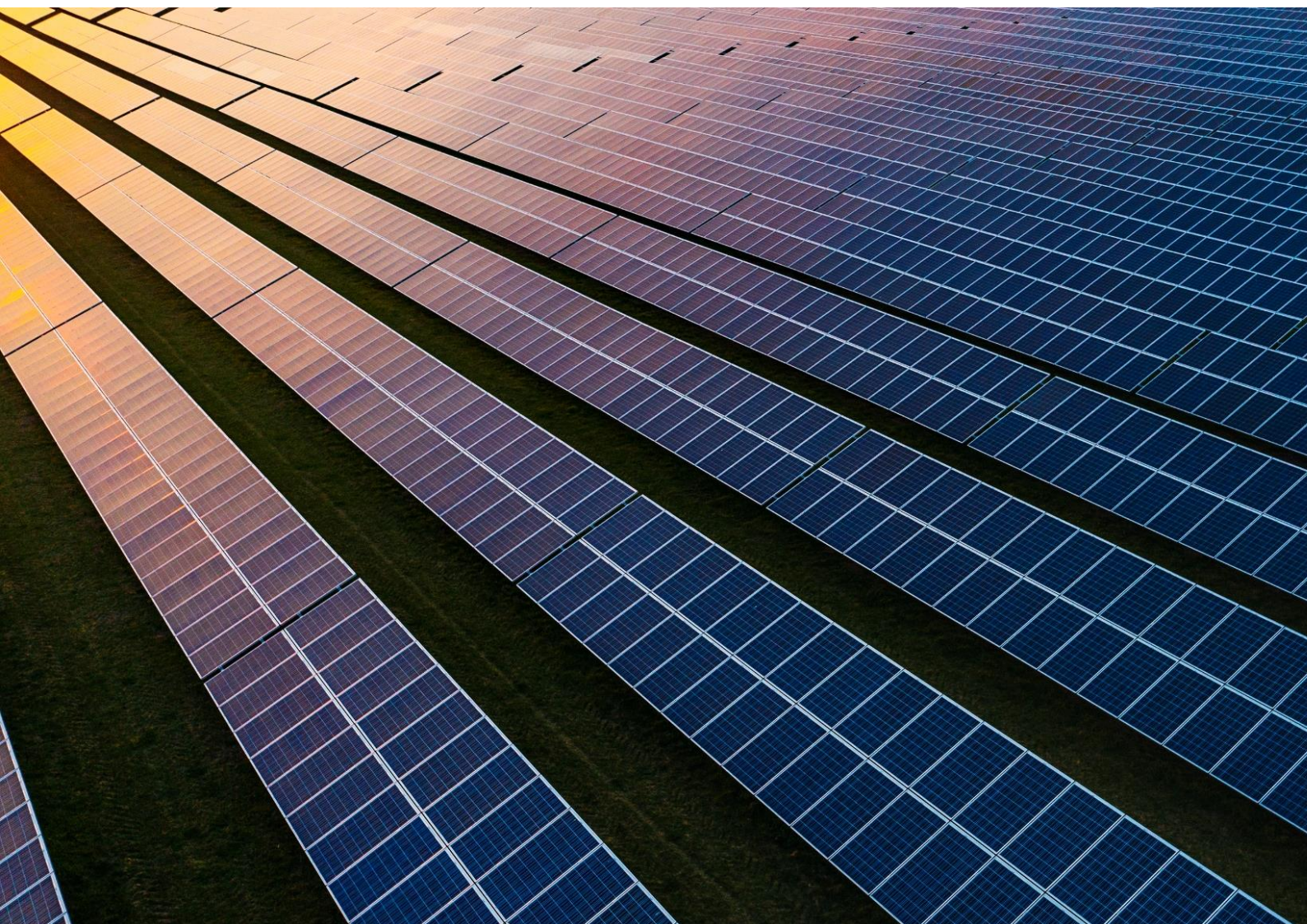
The Trustee for GreenPulse Solar
Farm and BESS Unit Trust

DATE

21 January 2026

REFERENCE

0751705



DOCUMENT DETAILS

DOCUMENT TITLE	Garoo Solar Farm and Battery Energy Storage System
DOCUMENT SUBTITLE	Noise Impact Assessment
PROJECT NUMBER	0751705
Date	21 January 2026
Version	Final
Author	Keshav Dhayam
Client name	The Trustee for Greenpulse Solar Farm and BESS Unit Trust

DOCUMENT HISTORY

				ERM APPROVAL TO ISSUE		
VERSION	REVISION	AUTHOR	REVIEWED BY	NAME	DATE	COMMENTS
Draft	00	Keshav Dhayam	Magaesh Naidu	Lucy Baker	01.07.2025	
Final	00	Keshav Dhayam	Magaesh Naidu	Lucy Baker	18.08.2025	
Final	01	Keshav Dhayam	Magaesh Naidu	Lucy Baker	5.11.2025	
Final	02	Keshav Dhayam	Magaesh Naidu	Lucy Baker	21.01.2026	

Garoo Solar Farm and Battery Energy Storage System

Noise Impact Assessment

0751705



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ACRONYMS AND ABBREVIATIONS

Acronyms	Description
Applicant	The Trustee for GreenPulse Solar Farm and BESS Unit Trust ('GreenPulse Solar Farm and BESS Unit Trust')
BESS	Battery Energy Storage System
CNVMP	Construction Noise and Vibration Management Plan
dB(A)	dB(A) denotes a single number sound pressure level that includes a frequency weighting ("A-weighting") to reflect the subjective loudness of the sound level. The frequency of a sound affects its perceived loudness. Human hearing is less sensitive at low and very high frequencies, and so the A-weighting is used to account for this effect. An A-weighted decibel level is written as dB(A).
DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
DECC	NSW Department of Environment and Climate Change (now DCCEEW)
DECCW	NSW Department of Environment, Climate Change and Water (now DCCEEW)
DPHI	NSW Department of Planning, Housing and Infrastructure
EPA	Environment Protection Authority
ICNG	Interim Construction Noise Guideline
L ₁₀	The noise level exceeded for 10 per cent of the time and is approximately the average of the maximum noise levels.
L ₉₀	The noise level exceeded for 90 per cent of the time and is approximately the average of the minimum noise levels. The L ₉₀ level is often referred to as the "background" noise level and is commonly used as a basis for determining noise criteria for assessment purposes.
L _{eq}	The 'equivalent continuous sound level', L _{eq} , is used to describe the level of a time-varying sound or vibration measurement. L _{eq} is often used as the "average" level for a measurement where the level is fluctuating over time. Mathematically, it is the energy-average level over a period (i.e., the constant sound level that contains the same sound energy as the measured level). When the dB(A) weighting is applied, the level is denoted dB L _{Aeq} . Often the measurement duration is quoted, thus L _{Aeq,15 min} represents the dB(A) weighted energy-average level of a 15-minute measurement.
L _{max}	The absolute maximum noise level in a noise sample.
NSR	Noise Sensitive Receiver
NPI	Noise Policy for Industry
NSW	New South Wales
OOH	Outside of recommended standard hours
PCS	Power Conversion System
PNTL	Project Noise Trigger Level
Project	Garoo Solar Farm and Battery Energy Storage System (BESS)
PV	Photovoltaic
RBL	The Rating Background Level (RBL) is the overall single figure background level representing each assessment period (day, evening, and night) over the whole monitoring period (as opposed to over each 24-hour period used for the ABL). This is the level used for assessment purposes. It is the median value of: • All day assessment background levels over the monitoring period for the day; • All evening assessment background levels over the monitoring period for the evening; or

Acronyms	Description
	All night assessment background levels over the monitoring period for the night.
RMS	Roads and Maritime Services
RNP	Road Noise Policy
SEARs	Secretary's Environmental Assessment Requirements
SPL	Sound Pressure Level
SSD	State Significant Development
SWL	Sound Power Level

EXECUTIVE SUMMARY

This Noise Impact Assessment (NIA) has been prepared for the Garoo Solar Farm and Battery Energy Storage System (BESS) (the Project) situated in the rural locality of Garoo, New South Wales (NSW), for The Trustee for GreenPulse Solar Farm and BESS Unit Trust (GreenPulse Solar Farm and BESS Unit Trust or the Applicant).

The Project will involve the construction, operation, maintenance and, where relevant, decommissioning of a solar farm and associated infrastructure, including: solar array, with an estimated generated capacity of up to 133.76 Megawatts (MW), Alternating Current (AC); electrical reticulation infrastructure, including a centralised large-scale BESS with a storage capacity of 360 MW / 1,440 Megawatt hours (MWh); permanent associated and ancillary infrastructure; and temporary construction facilities, including a temporary workers' accommodation camp (capacity 250 Full Time Equivalent (FTE)) for 15 months. The Project proposes to connect to the national grid via the existing 330 kilovolt (kV) Liddell-Tamworth overhead transmission line, which traverses the Project Area in a general north-south alignment.

The Project is considered to be State Significant Development (SSD) pursuant to Part 2.2, clause 2.6 and Schedule 1 of the *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP). This report supports a Development Application (DA) being prepared under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979*.

As per the project-specific Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning, Housing and Infrastructure (DPHI) (SSD-79747209, dated 4 March 2025), the Environmental Impact Statement (EIS) must address the key issues relating to noise.

This NIA addresses the SEARs for the Project including:

- An assessment of the potential construction noise impacts of the development in accordance with NSW Department of Environment and Climate Change (DECC) (now NSW Department of Climate Change, Energy, the Environment and Water [DCCEEW]) – *NSW Interim Construction Noise Guideline* (ICNG), July 2009;
- An assessment of operational noise impacts and cumulative noise impacts (considering other developments in the area) in accordance with the NSW Environment Protection Authority (EPA) – *Noise Policy for Industry* (NPI), October 2017; and
- An assessment of both operational and construction road traffic noise impacts in accordance with NSW Department of Environment, Climate Change and Water (DECCW) (now NSW DCCEEW) – *NSW Road Noise Policy* (RNP), March 2011.

The existing noise environment at identified Noise Sensitive Receivers (NSRs) was established, and construction and operational noise management levels and assessment criteria were developed in accordance with the relevant NSW standards and guidelines, namely the NPI, ICNG and the RNP.

Applicable worst-case construction and operational assessment scenarios were developed based on project information outlined in this report. Construction and operational noise levels were predicted and compared to the established noise management levels and criteria to evaluate compliance.

The construction noise assessment indicates that the ICNG 'noise affected' management level is exceeded at 5 sensitive receivers (R2a, R3, R4, R5, R2b) for construction scenarios CON 1, CON 2 and CON 3 as defined in Section 5. The results were based on worst-case assumptions of construction activities at the Project boundary fronting sensitive receivers in the absence of any noise mitigation measures. However, no exceedance of the ICNG 'highly noise affected' management level at any of the sensitive receivers is expected during construction.

The main noise contributors are the drum roller, the padfoot roller, the cranes and the small pile driving rigs. The duration of exceedances is variable due to the intermittent operation of construction equipment and the changing separation distances between noise sources and sensitive receivers. Noise management and control measures will be required to be implemented to mitigate impacts. The measures entail a combination of informing the community on operating duration of high noise emitting construction machinery, and the complaints' handling process. These measures are outlined in a draft Construction Noise and Vibration Management plan (CNVMP) for the Project (provided in **Appendix B** of this report).

No exceedance of the ICNG 'noise affected' management level during outside recommended standard hours (OOH) is expected from the temporary workers' accommodation camp.

For the operational noise impact assessment, the NPI sets out the Project Noise Trigger Levels (PNTLs) that are used to assess the potential impacts of noise from industry and indicate the noise level at which feasible and reasonable noise management measures should be considered.

The operational noise assessment indicates that with the incorporation of noise mitigation measures, all the identified sensitive receivers within 2 kilometres (km) of the Project boundary are predicted to achieve compliance with the NPI PNTLs. The applicable noise mitigation measures are:

- at-source measures – Installation of noise reduction kits and silencer kits for 1) all inverters located in-between Photovoltaic (PV) module structures, 2) all BESS Battery Units and 3) all Power Conversion System (PCS) Stations; and
- at-path measures – 45 noise walls, with the following configuration:
 - 4.0 m high L-shaped noise walls at 42 PCS Stations; and
 - 8.0 m high C-shaped noise walls at 3 high voltage transformers.

The nearest developments to the identified NSRs are Middlebrook Solar Farm and BESS, and Lambruk Solar Farm which are located more than 20 km away from this Project. Their contribution to cumulative noise is expected to be insignificant at the nearest NSRs to this Project.

Opportunities for other mitigation strategies through technology selection, localised equipment noise control among other options with equivalent or improved noise impact mitigation performance may be considered in the detailed design phase.

Equipment selection and quantity are to adhere to the Sound Power Level (SWL) per plant item and quantity specified in the assessment. Should the SWL, location or quantity of the selected equipment change significantly, this assessment should be revised to incorporate the changes in design.

Construction and operational traffic noise impacts arising from additional traffic associated with the Project have been assessed. Construction and operational road traffic impacts are not

expected at all sensitive receivers in accordance with the assessment methodology and criteria outlined in the RNP.

1. INTRODUCTION

This Noise Impact Assessment (NIA) has been prepared for the Garoo Solar Farm and Battery Energy Storage System (BESS) (the Project) situated in the rural locality of Garoo, New South Wales (NSW), for The Trustee for GreenPulse Solar Farm and BESS Unit Trust (GreenPulse Solar Farm and BESS Unit Trust or the Applicant).

The Project is a State Significant Development (SSD) pursuant to Part 2.2, clause 2.6 and Schedule 1 of the *State Environmental Planning Policy (Planning Systems) 2021* (Planning Systems SEPP). This report supports an Environmental Impact Statement (EIS) for the Project being prepared under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

As per the project-specific Secretary's Environmental Assessment Requirements (SEARs) (SSD-79747209, dated 4 March 2025), the EIS must address the key issues relating to noise.

This NIA addresses the SEARs for the Project including:

- An assessment of the potential construction noise impacts of the development in accordance with NSW Department of Environment and Climate Change (DECC) (now NSW Department of Climate Change, Energy, the Environment and Water [DCCEEW])– *NSW Interim Construction Noise Guideline* (ICNG), July 2009;
- An assessment of operational noise impacts and cumulative noise impacts (considering other developments in the area) in accordance with the NSW Environment Protection Authority (EPA) – *Noise Policy for Industry* (NPI), October 2017; and
- An assessment of both operational and construction road traffic noise impacts in accordance with NSW Department of Environment, Climate Change and Water (DECCW) (now NSW DCCEEW) – *NSW Road Noise Policy* (RNP), March 2011.

1.1 PROJECT DESCRIPTION

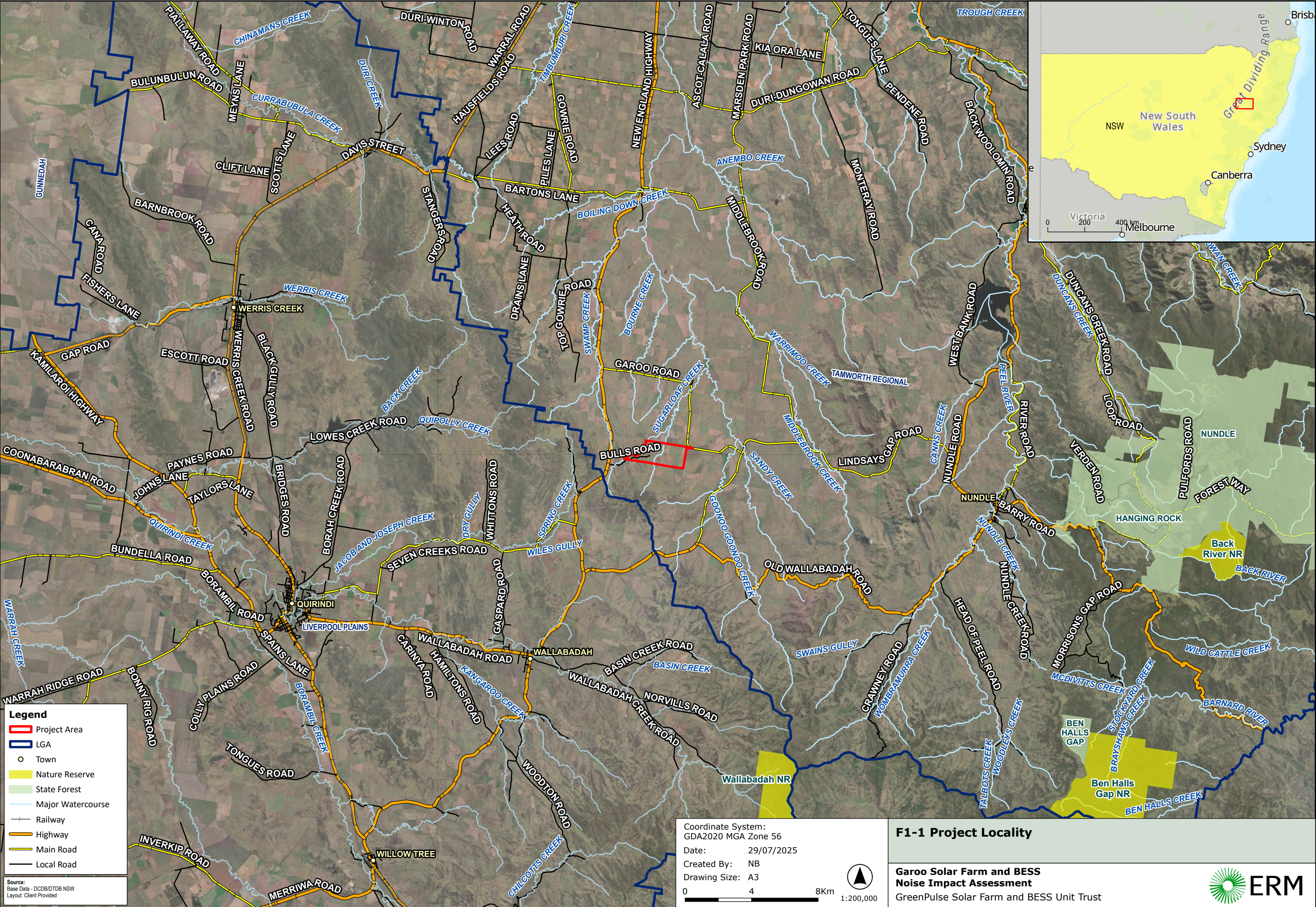
The Project is situated at 291 Garoo Road, Garoo, approximately 40 kilometres (km) (by road) south of Tamworth and 370 km northwest of Sydney. Located entirely within the Tamworth Regional Local Government Area (LGA), the Project Area extends across approximately 369 hectares (ha). The land is currently used for agricultural activities, predominantly livestock grazing and irrigated cropping.

The Project will involve the construction, operation, maintenance and, where relevant, decommissioning of a solar farm and associated infrastructure, including:

- Solar array, with an estimated generated capacity of up to 133.76 Megawatts (MW) Alternating Current (AC);
- Electrical reticulation infrastructure, including a centralised large-scale BESS with a storage capacity of 360 MW / 1,440 Megawatt hours (MWh);
- Permanent associated and ancillary infrastructure;
- Temporary construction facilities; and
- On-site temporary infrastructure, including a temporary workers' accommodation camp (capacity 250 Full Time Equivalent (FTE)) for 15 months.

The Project proposes to connect to the national grid via the existing 330 kilovolt (kV) Liddell-Tamworth overhead transmission line, which traverses the Project Area in a general north-south alignment.

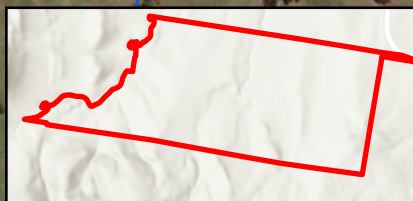
The Project locality is shown in **Figure 1-1**. The Project layout is shown in **FIGURE 1-2**. The workforce accommodation camp is shown in **Figure 1-3**.





Sources:
Boundary: Client Provided (20250415)
Base Data: NSW DCDB/DTDB
Imagery: ESRI World Imagery

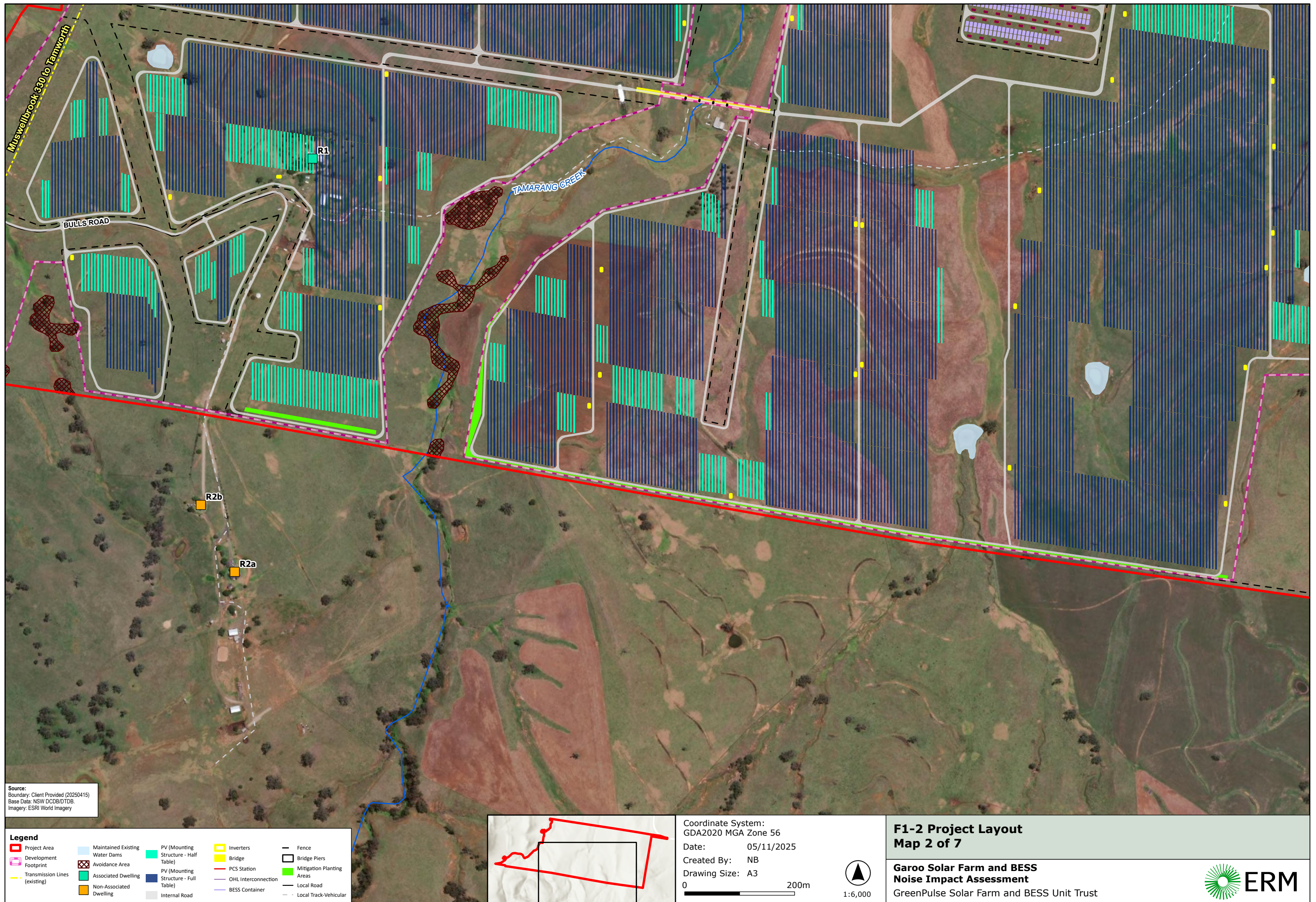
Legend				
Project Area	Transmission Lines (existing)	PV (Mounting Structure - Half Table)	Customer Substation Area	BESS Container
Development Footprint	Maintained Existing Water Dams	PV (Mounting Structure - Full Table)	Transgrid Substation Area	Strategic Road Upgrade
Preferred access point	Avoidance Area	Internal Road	Inverters	Fence
Emergency Access point	Associated Dwelling	Parking and Laydown Area	Bridge	O&M Building
	Non-Associated Dwelling		PCS Station	Bridge Piers
			OHL Interconnection	Noise Walls - PCS Stations



Coordinate System:
GDA2020 MGA Zone 56
Date: 05/11/2025
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F1-2 Project Layout
Map 1 of 7

Garoo Solar Farm and BESS
Noise Impact Assessment
GreenPulse Solar Farm and BESS Unit Trust





Source:
Boundary: Client Provided (20250415)
Base Data: NSW DCDB/DTDB
Imagery: ESRI World Imagery

Legend

Project Area

Development

Footprint

Preferred access point

Emergency Access point

Strategic Road Upgrade

Local Road

Local Track-Vehicular

Coordinate System:
GDA2020 MGA Zone 56
Date: 05/11/2025
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**F1-2 Project Layout
Map 3 of 7**

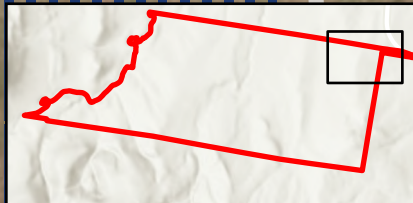
**Garoo Solar Farm and BESS
Noise Impact Assessment**
GreenPulse Solar Farm and BESS Unit Trust

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Sources:
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Base Data: NSW DCDB/DTDB
Imagery: ESRI World Imagery

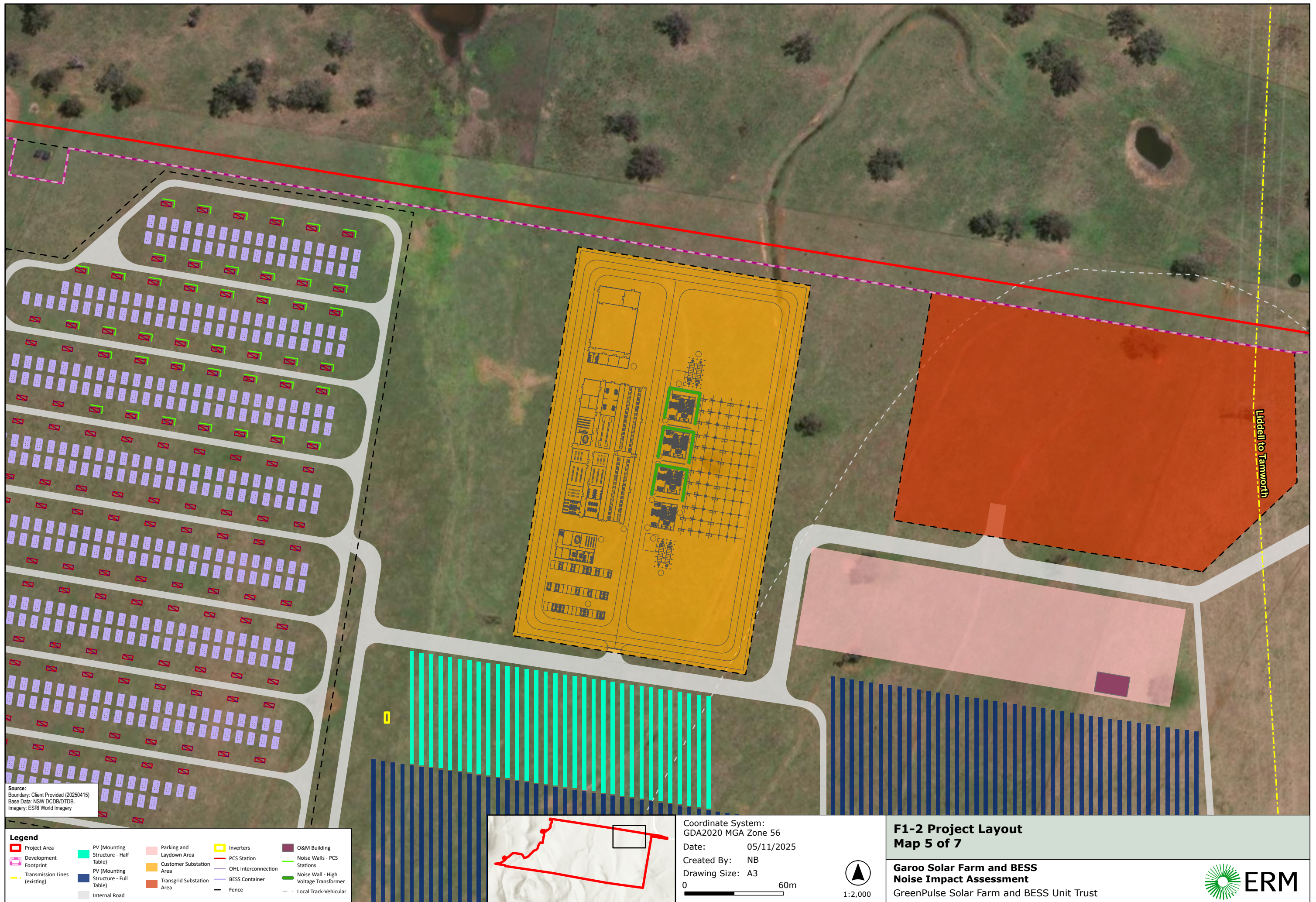
Legend			
Project Area	PV (Mounting Structure - Half Table)	Internal Road	Transgrid Substation Area
Development Footprint	PV (Mounting Structure - Full Table)	Parking and Laydown Area	Inverters
Transmission Lines (existing)		Customer Substation Area	Strategic Road Upgrade
Avoidance Area		Fence	O&M Building
			Noise Wall - High Voltage Transformer
			Local Road
			Local Track-Vehicular

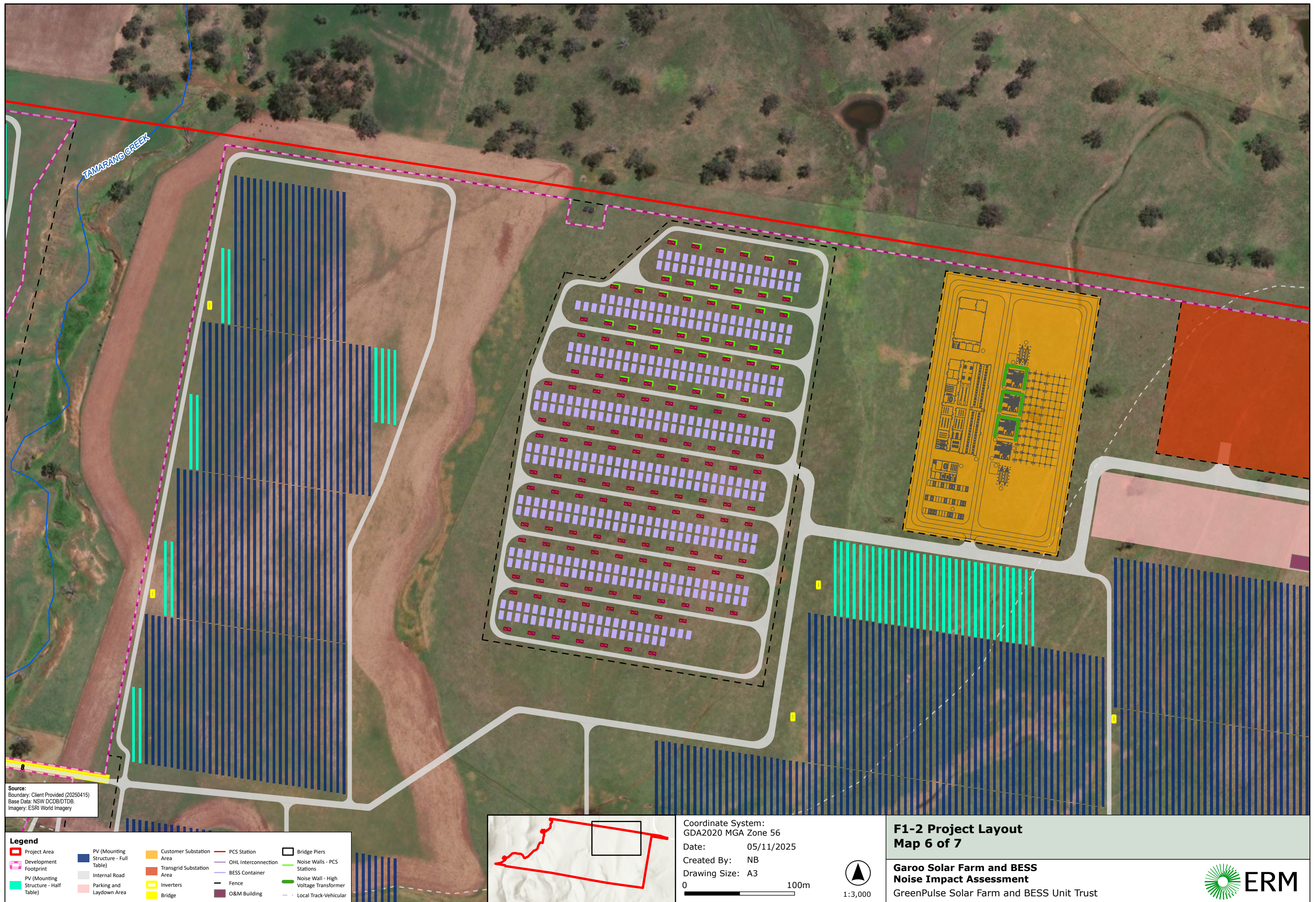


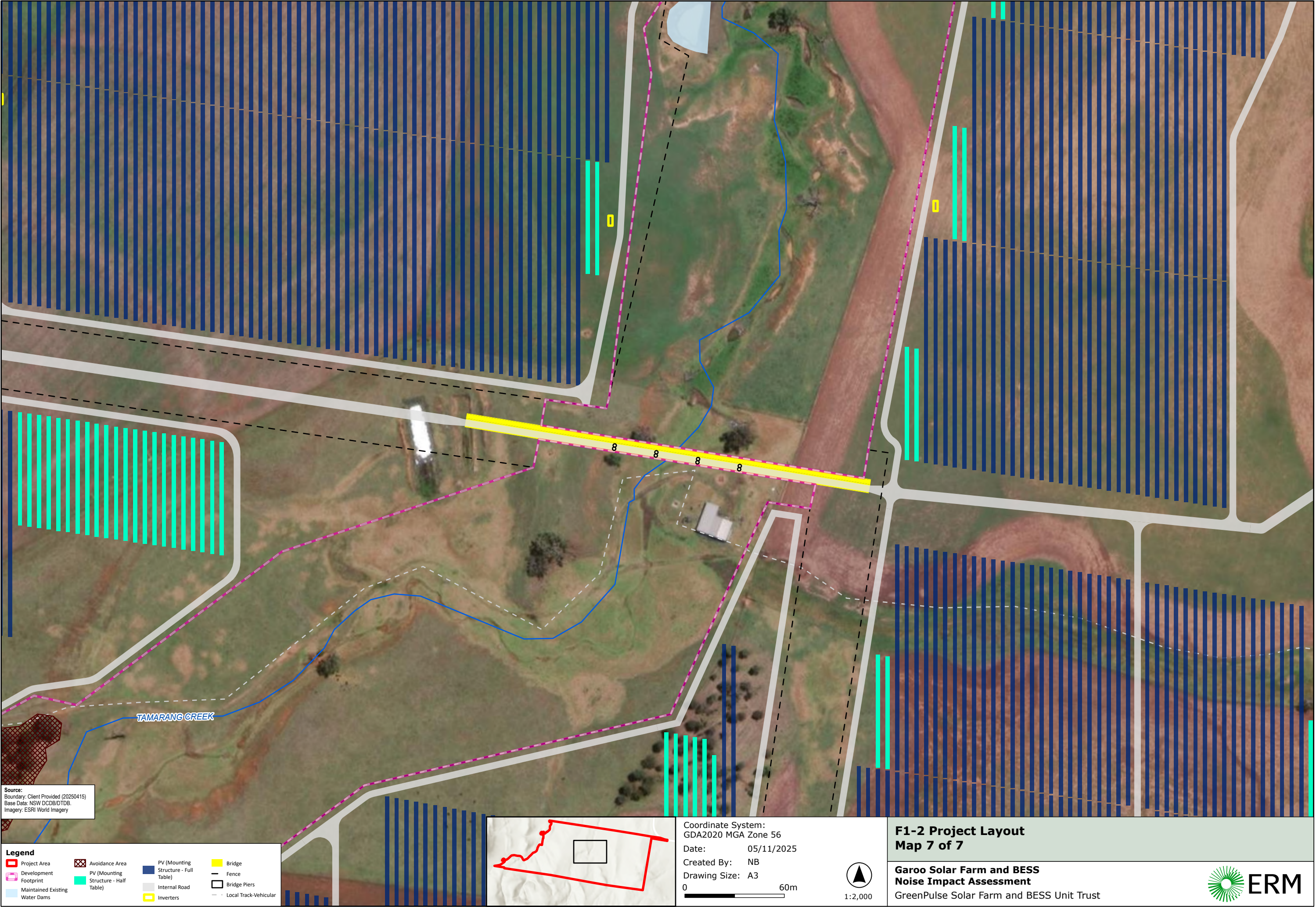
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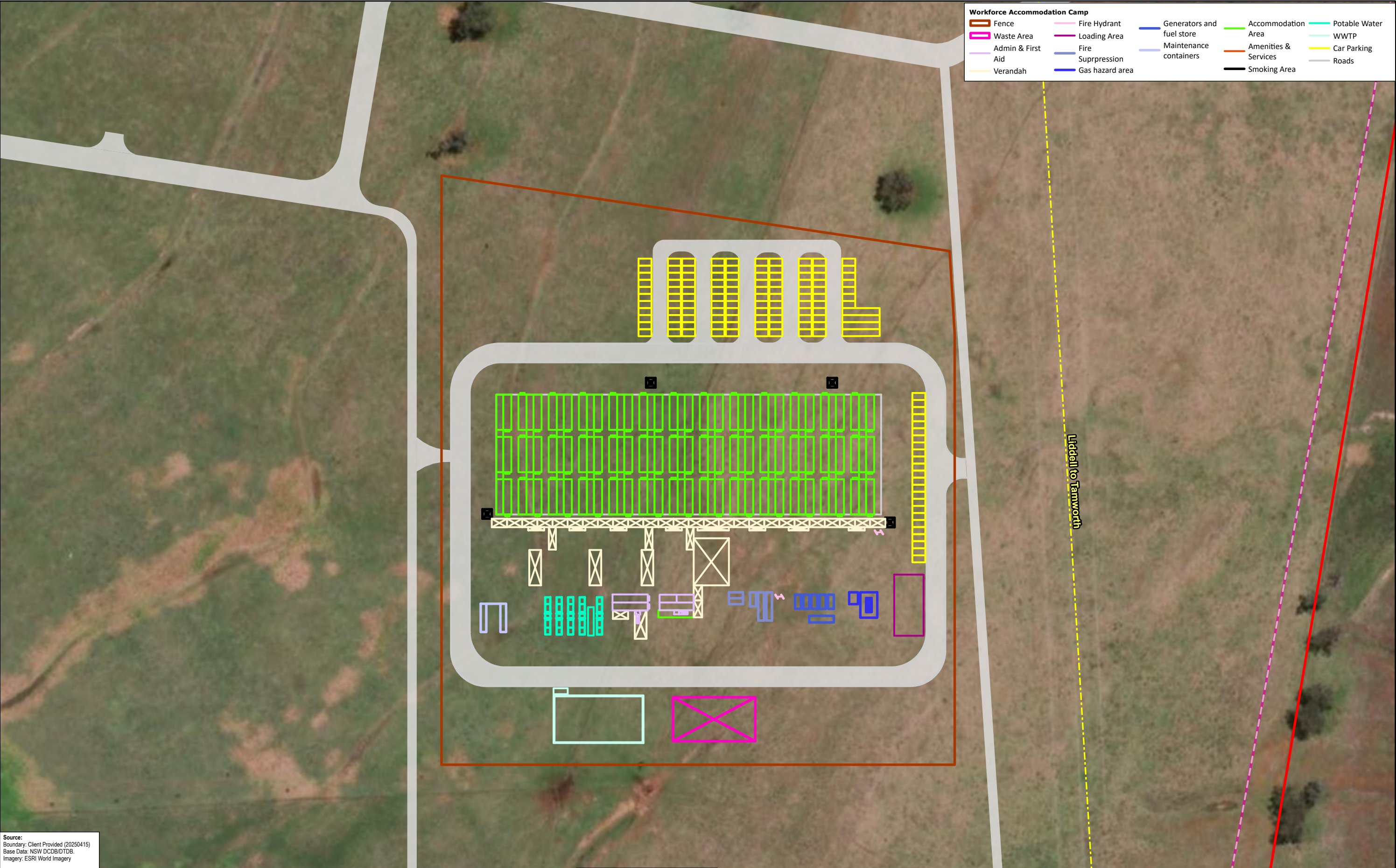
F1-2 Project Layout
Map 4 of 7

Garoo Solar Farm and BESS
Noise Impact Assessment
GreenPulse Solar Farm and BESS Unit Trust



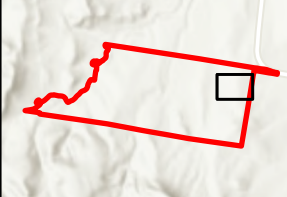






Source:
Boundary: Client Provided (20250415)
Base Data: NSW DCDB/DTDB
Imagery: ESRI World Imagery

- Legend**
- Project Area
 - Development Footprint
 - Transmission Lines (existing)
 - Internal Road



Coordinate System:
GDA2020 MGA Zone 56
Date: 19/01/2026
Created By: NB
Drawing Size: A3



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**F1-3 Workforce Accommodation Camp
Map 2 of 2**

**Garoo Solar Farm and BESS
Noise Impact Assessment**
GreenPulse Solar Farm and BESS Unit Trust



1.2 OBJECTIVES

The objectives of this report are to provide an assessment of potential noise and vibration impacts associated with the construction and operation of the Project, and to recommend feasible and reasonable noise mitigation and management measures. These mitigation and management measures are designed to ensure that the construction and operation of the Project are carried out in compliance with the noise assessment management levels and criteria established in this report.

The noise and vibration assessment was undertaken based on the design information, site and layout plans, equipment lists and manufacturers' specifications, and operating modes outlined in this report.

1.3 SCOPE OF WORKS

The scope of the assessment includes:

- Evaluation of the existing noise environment and identification of Noise Sensitive Receivers (NSRs);
- Establishment of project-specific noise criteria in accordance with the ICNG, NPI and RNP at noise sensitive receivers for compliance assessment;
- Determining the extent of construction noise and vibration impacts (if any) associated with the construction of the proposed solar farm and BESS in accordance with the ICNG;
- Determining the extent of operational noise impacts (if any) associated with the operation of the proposed solar farm and BESS, and cumulative noise impacts (considering other developments in the area) in accordance with the NPI;
- Determining the extent of traffic noise impacts (if any) associated with the construction and operation of the proposed solar farm and BESS in accordance with the RNP;
- Recommendation of mitigation measures to be implemented on site to ensure compliance with the operational and construction project-specific noise criteria; and
- Preparation of a draft Construction Noise and Vibration Management Plan (CNVMP).

1.4 ADHERANCE TO SEARS

This NIA addresses the Secretary's Environmental Assessment Requirements (SEARs) (SSD-79747209, dated 4 March 2025) for the Project as described in **Table 1-1**.

TABLE 1-1 ADHERANCE TO SEARS

SEARs Noise Requirement	Section in NIA addressing requirement
• An assessment of the construction noise impacts (including impacts from proposed road upgrades) of the development in accordance with the Interim Construction Noise Guideline (ICNG)	Section 5
• An assessment of operational noise impacts in accordance with the NSW Noise Policy for Industry (2017)	Section 6
• An assessment of traffic noise impacts in accordance with the NSW Road Noise Policy (DECCW, 2011)	Section 7

SEARs Noise Requirement	Section in NIA addressing requirement
• An assessment of cumulative noise impacts (considering other developments in the area), including (where appropriate):	Section 6.4
◦ Identification of impacts associated with construction, site emission and traffic generation at noise affected sensitive receivers, including the provision of operational noise contours;	Sections 5,6 and 7
◦ Details of noise monitoring survey, background noise levels and amenity noise levels at the most-affected residential receivers;	Not Relevant
◦ Details of likely daily charging/discharging load profile, manufacturer specifications for plant and equipment and noise source inventory (including intensity, quantity, location, directivity and frequency information)	Not Relevant
◦ An assessment of 'worst case' noise emission scenarios during periods of discharging and charging;	Not Relevant
◦ Consideration of annoying characteristics of noise and prevailing meteorological conditions in the study area; and	Not Relevant
◦ Details and analysis of the effectiveness of proposed management and mitigation measures to adequately manage identified impacts, including a clear identification of residual noise and vibration impacts following application of these mitigation measures and details of any proposed compliance monitoring programs.	Section 8

2. EXISTING NOISE ENVIRONMENT

Noise sensitive receivers within 2 km of the Project boundary have been identified, as tabulated in **Appendix A**. The noise sensitive receivers are shown graphically, relative to the Project, in the noise contour map presented in **Appendix C**.

The noise environment in the vicinity of the Project and at noise sensitive receivers is best described as rural residential. Rural residential is described in the NPI (EPA, 2017) as an area with an acoustical environment that is dominated by natural sounds (such as foliage noise, birdsong and insect noise) having little or no road traffic noise (from Denman Road) and is generally characterised by low background noise levels. Settlement patterns (rural residential) would be typically sparse.

The background noise levels at the noise sensitive receivers within 2 km of the Project are expected to be similar to the minimum assumed Rating Background Levels (RBLs) specified in *Table 2.1* of the NPI, as presented in **Table 3-2**.

The use of minimum assumed RBLs is reasonable in rural environments where there are no prominent noise sources associated with roads, rail and industrial plant influencing the noise environment at the receivers. It also allows for the strictest NPI Project Noise Trigger Levels (PNTLs) to be developed. The PTNLs applicable to the noise sensitive receivers are further discussed in **Section 4**.

3. NOISE POLICIES, GUIDELINES AND STANDARDS

This assessment has been conducted in accordance with the following policies and guidelines:

- NSW Department of Environment and Climate Change (DECC) (now NSW DCCEEW) – *NSW Interim Construction Noise Guideline* (ICNG), July 2009;
- NSW Environment Protection Authority (EPA) – *Noise Policy for Industry* (NPI), October 2017; and
- NSW Department of Environment, Climate Change and Water (DECCW) (now NSW DCCEEW) – *NSW Road Noise Policy* (RNP), March 2011.

Further information regarding the application of the key policy and guidelines is provided below.

3.1 NSW INTERIM CONSTRUCTION NOISE GUIDELINE

The ICNG (DECC, 2009), presents an accepted method to assess construction noise impacts for a range of receiver types. It provides a set of recommended standard hours of construction, specifically:

- Monday to Friday: 7am to 6pm;
- Saturday: 8am to 1pm; and
- No work on Sundays or public holidays.

Construction outside these hours might be undertaken in accordance with the ICNG for the following categories of work:

- The delivery of oversized plant or structures that police or other authorities determine require special arrangements to transport along public roads;
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm; and
- Works where a proponent demonstrates and justifies a need to operate outside the recommended standard hours.

The ICNG encourages works to occur within the recommended standard hours of construction unless justification is provided. It focuses on minimising noise by managing construction noise impacts, rather than only on achieving numeric noise levels, and recognises that some noise from construction sites is inevitable.

The ICNG encourages organisations involved with construction, maintenance or upgrading works (e.g., large scale contractors or Government agencies) to develop best-practice techniques for managing construction noise and vibration and implementing feasible and reasonable mitigation measures.

The ICNG is suitable to quantitatively assess potential noise emissions and impacts associated with Project construction. The ICNG assessment methodology has been adopted to develop project-specific construction noise management levels, assess potential impacts, and recommend any necessary mitigation, management measures.

Table 3-1 details the ICNG construction noise management levels guidance for residential receivers.

TABLE 3-1 CONSTRUCTION NOISE MANAGEMENT LEVELS FOR RESIDENTIAL RECEIVERS

Time of day	Management Level, L_{eq} (15min), dB(A)	How to apply
Recommended standard hours (SH): - Monday to Friday: 7am to 6pm; - Saturday: 8am to 1pm; and - No work on Sundays or public holidays.	Noise affected RBL + 10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured L_{eq}, 15 minute is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be a strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, considering: - Times identified by the community when they are less sensitive to noise (e.g., before and after school for works near schools); - Mid-morning or mid-afternoon for works near residences; and - If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours (OOH): All other times including Public Holidays.	Noise affected RBL + 5 dB(A)	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the ICNG.

3.2 NSW NOISE POLICY FOR INDUSTRY

Responsibility for the control of noise emissions in NSW is typically vested in Local Government and the NSW Environment Protection Authority (EPA). The NPI (EPA, 2017) provides a framework and methodology for deriving criteria for project consent and environment protection licence conditions.

The criteria, referred to as the PNTLs, are defined in *Section 2.1* of the NPI and considers the lowest of the intrusive or amenity residential receiver criterion so that the most stringent threshold is set concerning existing industrial noise in the area. PNTLs are established with due regard to the requirements of the NPI for all identified residential. PNTLs for all associated assessment periods (Day, Evening and Night) are provided as noise sources are expected to be present during all these periods.

3.2.1 PROJECT INTRUSIVENESS NOISE LEVEL

The NPI states:

“The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. This intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment.”

The intrusiveness noise level is determined as follows:

$$L_{Aeq, 15min} \leq \text{Rating Background Noise Level} + 5 \text{ dB}$$

3.2.1.1 RATING BACKGROUND NOISE LEVEL AND PROJECT INTRUSIVE NOISE LEVEL

The RBL is the single-figure background L_{90} level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level).

For this assessment, noise monitoring was not conducted, instead the minimum RBL as per the NPI were applied. As such, the minimum intrusiveness noise levels were adopted, providing a conservative assessment of operational noise of the Project. The project intrusiveness noise levels are summarised in **Table 3-2**.

TABLE 3-2 MINIMUM ASSUMED RBLs AND PROJECT INTRUSIVENESS NOISE LEVELS

Time of day	Minimum assumed RBL, in dB(A)	Minimum project intrusiveness noise levels, in $L_{Aeq,15min}$ dB(A)
Day	35	40
Evening	30	35
Night	30	35

3.2.2 AMENITY NOISE LEVELS AND PROJECT AMENITY NOISE LEVELS

To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 2.2 of the NPI, where feasible and reasonable. The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and sleep disturbance. The receivers are all classified as rural residential and their corresponding noise amenity levels are given in **Table 3-3**.

TABLE 3-3 AMENITY NOISE LEVELS

Receiver/ Noise Amenity Area	Assessment Period	Recommended Amenity Noise Level, L_{eq} dB(A)
Residential Rural	Day	50
	Evening	45
	Night	40

Note:

- Day-time period is from 7am to 6pm (Monday to Saturday) and 8am to 6pm (Sundays and Public Holidays);
- Evening period is from 6pm to 10pm; and
- Night-time period is from 10pm to 7am (Monday to Saturday) and 10pm to 8am (Sundays and Public Holidays).

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

Project amenity noise level for industrial developments = Recommended amenity noise level minus 5 dB(A)

3.2.3 MAXIMUM NOISE LEVEL EVENT ASSESSMENT – SLEEP DISTURBANCE

The potential for sleep disturbance from maximum noise level events from the development during the night-time period needs to be considered. Sleep disturbance relates to both awakenings and disturbance to sleep stages.

A detailed maximum noise level event assessment should be undertaken where the subject development night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater; and/or
- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater.

The night-time noise levels subject to a detailed maximum noise level event assessment are therefore $L_{Aeq,15min}$ 40 dB(A) and/or L_{AFmax} 52 dB(A).

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Other factors that may be important in assessing the extent of impacts on sleep include:

- How often high noise events will occur;
- The distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject development;
- Whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods); and
- Current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.

3.3 NSW ROAD NOISE POLICY

The RNP (DECCW, 2011) outlines the range of measures needed to minimise road traffic noise and its impacts. It is intended for use by acoustics specialists as well as:

- Road project proponents;
- Determining authorities and regulators involved in the approval and construction of road projects and land use developments that generate additional traffic on existing roads; and
- City and transport planners and policymakers dealing with issues such as route corridors, heavy vehicle transport and building codes.

The RNP aims to identify the strategies that address the issue of road traffic noise from existing roads, new road projects, road redevelopment projects and new traffic-generating developments.

The RNP provides guidance, criteria, and procedures for assessing noise impacts from existing, new, and redeveloped roads and traffic generating developments. The assessment of road traffic noise impacts on residences near public roads is assessed under the RNP. In this case, the RNP is considered the suitable document to qualitatively assess potential noise emissions and impacts associated with construction and operational road traffic. The RNP details noise assessment criteria for various road categories and land uses. Road access to the Project will be via Denman Road, which is classified as a State road.

4. PROJECT SPECIFIC MANAGEMENT LEVELS AND CRITERIA

4.1 CONSTRUCTION NOISE MANAGEMENT LEVELS

Construction works are expected to occur only during the recommended standard daytime hours as defined in **Section 2.1**. The project-specific construction Noise Management Levels (NMLs), for works within the recommended standard hours for construction, are presented in **Table 4-1** below.

These NMLs have been established with due regard to the requirements of the ICNG for all identified residential and other sensitive non-residential receivers.

For this assessment, noise monitoring was not conducted and instead the minimum RBLs as stated in the NPI policy summarised in **Table 4-2** were applied. This provides a conservative construction noise assessment for the Project.

TABLE 4-1 CONSTRUCTION NOISE MANAGEMENT LEVELS

Receiver Type and Time of Day	Rating Background Level (RBL), dB(A)	Noise Affected Management Level, $L_{eq}(15 \text{ min})$, dB(A)	Highly Noise Affected Management Level, $L_{eq}(15 \text{ min})$, dB(A)
Residence - Recommended Standard Hours	35	45	75
Residence – Outside of recommended standard hours (OOH)	30	35	-

4.2 OPERATIONAL NOISE CRITERIA

4.2.1 PROJECT NOISE TRIGGER LEVELS

PNTLs have been determined in **Table 4-2** and are the more stringent level between the project intrusiveness noise level and the project amenity noise criteria for all assessment periods.

TABLE 4-2 NSW NPI CRITERIA - PNTLS

Receiver	Assessment period ^a	Project Intrusiveness Noise Level ^b L _{Aeq,15min} dB(A)	NPI Amenity Noise Level L _{Aeq,period} dB(A)	Project Amenity Noise Level L _{Aeq,15min} dB(A) ^{c,d}	Project Noise Trigger Level (PTNL) L _{Aeq,15min} dB(A)	Sleep Disturbance L _{Amax}
Residential	Day	40	50	48	40	-
	Evening	35	45	43	35	-
	Night	35	40	38	35	52

Notes:

^a Day-time period is from 7am to 6pm (Monday to Saturday) and 8am to 6pm (Sundays and Public Holidays; Evening period is from 6pm to 10pm and Night-time period is from 10pm to 7am (Monday to Saturday) and 10pm to 8am (Sundays and Public Holidays).

^b Based on RBL as noted in **Table 3-2**.

^c These levels have been converted to L_{Aeq, 15 minute} using the following: L_{Aeq, 15 minute} = L_{Aeq, period} + 3 dB (Reference: *Section 2.2* of the NPI).

^d To account for the existing industrial noise sources, '-5 dB' was applied to the Project Amenity Noise Level (Reference: *Section 2.4* of the NPI).

Table 4-2 shows that the PNTLs are dictated by the project intrusiveness noise levels for all assessment periods and are applicable to the operational noise assessment.

By meeting the PNTLs at the identified sensitive receivers, the noise levels at all other receivers located further away from the Project are expected to comply with the noise criteria of the NPI.

If the night-time PNTL of $L_{Aeq,15min}$ 35 dB(A) at the identified receivers is met, a detailed maximum noise level event assessment is not required.

4.3 ROAD TRAFFIC NOISE CRITERIA

The RNP criteria applicable to the nearest residences affected by additional road traffic due to the Project are presented in **Table 4-3**.

TABLE 4-3 RNP RESIDENTIAL ROAD TRAFFIC NOISE CRITERIA

Road Category	Type of Project/Land Use	Assessment Criteria – dB(A)	
		Day 7am to 10pm	Night 10pm to 7am
Freeway/ arterial/ sub-arterial (Garoo Road)	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	60 dB(A) $L_{Aeq,15\text{ hour}}$ (external)	55 dB(A) $L_{Aeq,9\text{ hour}}$ (external)

Note: The assessment criteria for external noise levels apply at 1 metre from the façade of any affected residential receiver.

It should be noted that the that the RNP criteria is applicable to a permanent road traffic scenario. The usage of the RNP criteria for an assessment of construction traffic noise, which is temporary, is considered conservative.

5. CONSTRUCTION NOISE ASSESSMENT

5.1 NOISE MODELLING METHODOLOGY

Conservative predictions of construction noise have been established through the calculation of the geometrical dispersion of noise with the assumption of flat topography, no acoustic shielding and no ground absorption effects.

The noise predictions consider the sound power level of the equipment operating continuously for a 15-minute period. It should be noted that the construction noise levels at any receiver depend on the type and duration of construction activity being undertaken and are expected to be variable over the total construction program.

Under a worst-case noise scenario, the construction noise sources are assumed to be at the boundary of the site fronting the nearest sensitive receivers, representing the shortest separation distance between noise source and receiver.

5.2 CONSTRUCTION NOISE SOURCES

The following typical construction noise sources and their sound power levels are anticipated for the project and are listed in **Table 5-1**.

TABLE 5-1 CONSTRUCTION NOISE SOURCES

Equipment	Sound Power Level per unit, dB(A)*
Small Pile Driving Rig	114
Crane	110
Drum Roller	109
Padfoot Roller	109
Wheeled Loader	109
Dump Truck	108
Excavator	107
Bulldozer	108
Scraper	116
Grader	107
Chain Trencher	104
Water Truck	104
Telehandler	98
Forklift	90
Tub Grinder/ Mulcher 40-50 hp	116

Note: *The sound power levels provided in the above table are based on AS 2436:2010 (Standards Australia, 2010) and the Transport for New South Wales Construction Noise and Vibration Guideline (TfNSW, 2016).

The following worst-case construction noise scenarios were assessed:

1. **CON 1** - Site preparation and establishment - A drum roller and a padfoot roller at the site's boundary fronting a sensitive receiver and operating continuously for 15 minutes;
2. **CON 2** - Delivery of infrastructure – Two cranes at the site's boundary fronting a sensitive receiver and operating continuously for 15 minutes; and
3. **CON 3** - General construction of infrastructure – Two small pile driving rigs at the site's boundary fronting a sensitive receiver and operating continuously for 15 minutes.

5.3 PREDICTED CONSTRUCTION NOISE LEVELS OF MACHINERY/EQUIPMENT

Predicted worst-case and unmitigated $L_{Aeq,15min}$ noise levels for all individual construction machinery/equipment and above-mentioned construction scenarios at the nearest sensitive receivers (within 2 km of the site's boundary where construction noise impacts may be present) have been presented in **Table 5-2**.

The following findings have been summarised from the results:

- The ICNG 'noise affected' management level is exceeded at:
 - 5 Sensitive Receivers (R2a, R3, R4, R5, R2b) for construction scenarios CON 1, CON 2 and CON 3;
- No exceedance of the ICNG 'highly affected' management level at any of the sensitive receivers is expected for all construction scenarios; and
- The main noise contributors are the drum roller, the padfoot roller, the cranes and the small pile driving rigs, as defined in the worst-case construction noise scenarios.

It should be noted that the predicted noise levels and the duration of any exceedances are variable due to the intermittent operation of construction equipment and the changing separation distances between mobile construction noise sources and sensitive receivers. A CNVMP is required as per standard practice for construction in NSW and in-principal noise and vibration mitigation measures are discussed in **Section 8.1**. As per the SEARs for this Project, a draft CNVMP is provided in **Appendix B**.

TABLE 5-2 PREDICTED CONSTRUCTION NOISE LEVELS

Sensitive Receiver ID	Equipment ^a															Scenario ^b		
	Small pile driving rig	Crane	Drum roller	Padfoot roller	Wheeled loader	Dump truck	Excavator	Bulldozer	Scraper	Grader	Chain trencher	Water truck	Telehandler	Forklift	Tub Grinder/Mulcher	CON 1	CON 2	CON 3
R2b	62	58	57	57	57	56	55	56	64	55	52	52	46	38	64	60	61	65
R2a	57	53	52	52	52	51	50	51	59	50	47	47	41	33	59	55	56	60
R3	56	52	51	51	51	50	49	50	58	49	46	46	40	32	58	54	55	59
R4	54	50	49	49	49	48	47	48	56	47	44	44	38	30	56	52	53	57
R5	51	47	46	46	46	45	44	45	53	44	41	41	35	27	53	49	50	54
R6	42	38	37	37	37	36	35	36	44	35	32	32	26	18	44	40	41	45
R9	42	38	37	37	37	36	35	36	44	35	32	32	26	18	44	40	41	45
R8	41	37	36	36	36	35	34	35	43	34	31	31	25	17	43	39	40	44

Notes:

The Noise Affected Management Level is $L_{Aeq(15 \text{ min})}$ 45 dB(A), and the Highly Noise Affected Management Level is $L_{Aeq(15 \text{ min})}$ 75 dB(A)

Noise Affected Management Level exceedances are shown in **bold** font. Important to note that these exceedances are only when the specific machinery is operating, or stated construction scenario is occurring.

^a Predicted noise levels for equipment are for the operation of a single equipment item at the Solar Farm boundary fronting each assessed Sensitive Receiver

^b Construction scenarios CON 1, CON 2 and CON 3 are defined above.

5.4 CONSTRUCTION VIBRATION – SAFE WORKING DISTANCES

Safe working distances for vibration causing plant, which may be used during the construction activities, have been taken from the Transport for New South Wales Construction Noise Strategy (TfNSW, 2016) and are summarised in **Table 5-3**.

TABLE 5-3 RECOMMENDED SAFE WORKING DISTANCES

Plant Item	Rating/Description	Safe Working Distance, in metres	
		Cosmetic Damage (BS 7385. ¹)	Human Response (AS 2670)
Vibratory Roller	<50kN (1-2t)	5	15 to 20
Vibratory Roller	<100kN (2-4t)	6	20
Vibratory Roller	<200kN (4-6t)	12	40
Vibratory Roller	<300kN (7-13t)	15	100
Small Hydraulic Hammer	300kg – 5 to 12t excavator	2	7
Medium Hydraulic Hammer	900kg – 12 to 18t excavator	7	23

The safe working distances for a typical vibration causing plant in construction range from 7 to 100 metres (m) to trigger a human response. There is no vibration sensitive receiver within this range and therefore vibration impacts are not expected to result from the project.

5.5 TEMPORARY WORKERS' ACCOMMODATION CAMP

The temporary workers' accommodation camp will comprise of up to 75 portable cabins and consists of the following noise sources:

- Air conditioning condenser outdoor units; and
- Use of the car parking facilities, north of the cabins.

The closest noise sensitive receiver is identified to be R3 which is located approximately 700 m northeast of the accommodation camp.

Noise impact from air conditioning condenser outdoor unit

A typical air conditioning condenser outdoor unit with one condenser fan suitable for a cabin is assumed to have a sound power level of up to 75 dB(A).

By following the noise modelling methodology described in Section 5.1, and assuming a worst-case scenario during the peak construction period of 75 air conditioning condenser outdoor units running simultaneously, the predicted noise impact noise levels at R3 is 29 dB(A) $L_{eq}(15 \text{ min})$.

Therefore, no exceedance of the ICNG 'noise affected' management level during outside of recommended standard hours (OOH) of 35 dB(A) $L_{eq}(15 \text{ min})$ at any of the noise sensitive

¹ BS 7385 -2: 1993 Guide to damage levels from ground borne vibration

receivers is expected. It should be noted no other construction noise sources are expected to be present outside of the recommended standard hours.

Noise from car parking facilities

Noise from one car parking movement per hour is assumed to be 64 dB(A). A 3 dB correction is added to account for rough pavement surface, referenced from the "Prediction of parking area noise in Australian Conditions" paper presented at the 2011 Conference of the Australian Acoustical Society (Ron Rumble Renzo Tonin, 2011).

By following the noise modelling methodology described in Section 5.1, and assuming a worst-case scenario during the peak construction period of 150 car park movements in one hour, the predicted noise impact noise levels at R3 is 17 dB(A) $L_{eq(15 \text{ min})}$. No exceedance of the ICNG 'noise affected' management level during OOH of 35 dB(A) $L_{eq(15 \text{ min})}$ at any of the noise sensitive receivers is expected. During the recommended standard hours, noise from car parking facilities will not contribute to noise generated by other construction noise sources.

6. OPERATIONAL NOISE ASSESSMENT

6.1 METHODOLOGY

Noise modelling has been undertaken using the CONCAWE algorithm (Manning, 1981), as implemented within SoundPLAN 9.1. The noise modelling takes into consideration the sound power levels of the proposed site equipment, and applies adjustments for attenuation from geometrical dispersion, acoustic shielding from intervening ground topography, ground effects, meteorological effects, and atmospheric absorption.

The main noise modelling parameters are summarised in **Table 6-1**.

TABLE 6-1 NOISE MODELLING PARAMETERS

Modelling Aspect	Parameter
Software	SoundPLAN 9.1
Outdoor Noise Propagation Algorithm	CONCAWE incorporating the ISO 171534-3 (improved method selected)
Ground Absorption Factor	0.5 (50% acoustically hard ground and 50% acoustically soft ground)
Topographical contours	10 m intervals
Receiver height	1.5 m
CONCAWE Meteorological Inputs	- Daytime/Evening: Stability category D with wind speed of 3m/s; and - Night-time: Stability category F with wind speed of 2m/s.

6.2 OPERATIONAL NOISE SOURCES

Table 6-2 summarises the noise sources and modelling assumptions for this assessment. The locations of all modelled noise sources are displayed in **Figure 6-1**.

TABLE 6-2 MODELLED NOISE SOURCES AND ASSUMPTIONS

Location as per Figure 6-1	Plant Item	Sound Power Level per Plant Item, $L_{Aeq}(15 \text{ min})$ dB(A)	Sound Power Level Reference	Quantity	Assumptions
PV Mounting Structure (Blue Areas)	Tracker motor for PV module	59	Manufacturer's data reference – NEXTracker	2289	- A NEXTracker tracker motor with a sound power level of 78 dB(A); - Operational for 0.2 minutes during a 15-minute period; - Height is assumed to be 1.6m; and - Operates in the day/evening periods only.
In-between PV Mounting Structure Area (Yellow Boxes)	Inverter	83.2	Manufacturer's data reference – SMA Solar Tech SC 4400 UP (with silencer kit)	38	- Reference data – Sound Power Level of 83.2 dB(A) with silencer kit (Maximum rated power); - Dimensions are specified at 2.8m (W) x 2.3m (H) x 1.6m (D); and - Operates in the day/evening periods only.
Customer Substation Area (Orange Area – Marked with a 'T')	High Voltage Transformer	92	-	2 (33kV/330kV - 220MVA) 2 (33kV/330kV - 100MVA)	- Reference data – Sound Power Level of 92 dB(A); and - Source modelled at a height of 5.0m.
BESS Container (Purple Boxes)	BESS Battery Unit	78.8	Manufacturer's data reference – Acoustic Emission Report for SunTera 5.015MWh IEC BESS: Jinko JKE-5015-2H-LAA (with noise reduction kit)	426	- Reference data – Sound Power Level of 78.8 dB(A) with noise reduction kit (Fan speed of 4x 1600rpm); and - Dimensions are specified at 6.1m (W) x 2.4m (D) x 2.9m (H).

Location as per Figure 6-1	Plant Item	Sound Power Level per Plant Item, $L_{Aeq(15 \text{ min})}$ dB(A)	Sound Power Level Reference	Quantity	Assumptions
PCS Station (Red Boxes)	PCS Station	85.9	Manufacturer's data reference – SMA Solar Tech SC 3800 UP-XT (with silencer kit)	142	- Reference data – Sound Power Level of 85.9 dB(A) with silencer kit (Maximum rated power); and - Dimensions are specified at 2.8m (W) x 2.3m (H) x 1.6m (D).

The locations of the noise sources are displayed in **Figure 6-1**.

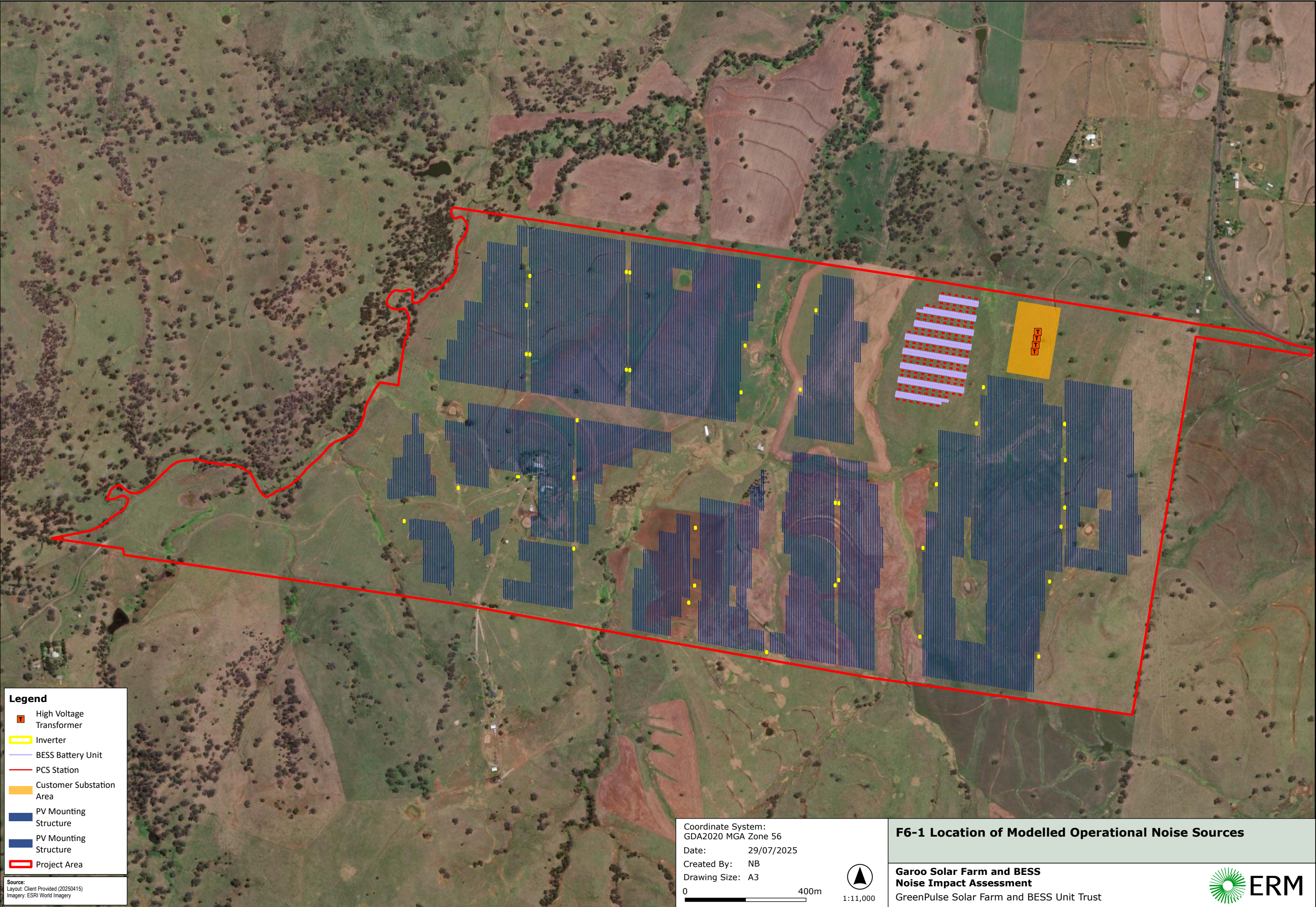
Noise mitigation measures associated with reducing site noise emissions have been incorporated into the Project design as a commitment by the Applicant and are discussed in **Section 8.2**, with the aim of achieving compliance with the assessment criteria.

The applicable noise mitigation measures are:

- at-source measures – Installation of noise reduction kits and silencer kits for 1) all inverters located in-between PV module structures, 2) all BESS Battery Units and 3) all PCS Stations; and
- at-path measures – 45 noise walls, with the following configuration:
 - 4.0 m high L-shaped noise walls at 42 PCS Stations; and
 - 8.0 m high C-shaped noise walls at 3 High Voltage transformers.

All noise predictions presented hereinafter have considered these mitigation measures.

The layout of the noise walls is presented in **Figure 8-1** and **Figure 8-2**.



6.3 MODELLING RESULTS

The predicted operational noise levels (incorporating the noise mitigation measures detailed in **Section 8.2**) have been compared with the PNTLs.

Predicted operational noise levels at the nearest NSRs within 2 km of the Project boundary for the day, evening and night-time noise enhancing meteorological conditions as required by the NPI are shown in **Table 6-3**. Noise prediction values at NSRs beyond 2km of the Project boundary are too low to be quantifiable.

The noise contours displaying the predicted operational noise levels at identified sensitive receivers for noise-enhancing meteorological conditions are provided in **Appendix C**.

The predicted operational noise levels indicate compliance with the relevant NPI PNTLs at all assessed NSRs based on the modelled noise sources' assumptions presented in **Table 6-2**.

TABLE 6-3 PREDICTED OPERATIONAL NOISE LEVELS

Sensitive Receiver ID	Distance to Project Boundary, in metres	Assessment Criteria, PNTLs in $L_{Aeq,15 \text{ min}}$, dB(A) Day / Evening / Night-time	Predicted Operational Noise Level for Noise Enhancing Meteorological Conditions* in, $L_{Aeq,15 \text{ min}}$, dB(A)		
			Day	Evening	Night-time
R2b	163	40 / 35 / 35	31	31	27
R2a	271	40 / 35 / 35	31	31	27
R3	312	40 / 35 / 35	34	34	34
R4	383	40 / 35 / 35	22	22	<20
R5	551	40 / 35 / 35	35	35	35
R6	1530	40 / 35 / 35	<20	<20	<20
R9	1572	40 / 35 / 35	<20	<20	<20
R8	1859	40 / 35 / 35	<20	<20	<20

Note:

* Day/Evening: stability categories A–D with light winds up to 3 m/s at 10 m AGL.

** Night: stability categories A–D with light winds up to 3 m/s at 10 m AGL and/or stability category F with winds up to 2 m/s at 10 m AGL.

6.4 CUMULATIVE IMPACTS

The Project is located within proximity of the New England Renewable Energy Zone (REZ), which was proposed to facilitate the coordinated development of renewable energy generation projects, energy storage and transmission. This means that the region is planned to have a significant number of renewable energy developments, as well as other SSD projects, that may lead to cumulative noise impacts at sensitive receivers.

The nearest developments to the NSRs are listed in **Table 6-4**.

TABLE 6-4 NEAREST NOISE-GENERATING DEVELOPMENTS

Development	Brief Description	Distance from the Project	Status as of March 2025
Middlebrook Solar Farm and BESS	320 MW of solar capacity with a 300 MW / 600 MWh BESS	25 km	Recommendation with Independent Planning commission (IPC)
Lambruk Solar Farm	500 (DC) / 300 (AC) MW of solar capacity with a 300 MW / 1200 MWh BESS	37.5 km	Prepare EIS

Noise impact assessments for the nearest developments are noted to be under preparation as of June 2025. In line with similar projects and development consent approvals, it is expected that the noise impacts from the nearest developments will be assessed in accordance with and comply with the NPI (EPA, 2017).

Middlebrook Solar Farm and BESS, and Lambruk Solar Farm are located more than 20 km away from this Project and their contribution to cumulative noise are assumed to be insignificant at the nearest NSRs to this Project.

The NPI project amenity noise level is specifically used for addressing cumulative noise impacts and has already been considered in the development of the PNTLs for this Project. The predicted noise levels for the Project indicate compliance with the PNTLs and therefore, also demonstrates that cumulative impacts are unlikely. The two nearest noise-generating projects in **Table 6-4** are expected to also achieve the NPI project amenity noise levels to address cumulative noise impacts that consider this project.

7. TRAFFIC NOISE ASSESSMENT

This section assesses noise impacts from noise generated by additional traffic associated with Project construction and operation.

7.1 EXISTING ROAD TRAFFIC

Existing road traffic data, relevant to this assessment, for Garoo Road near the proposed site access was obtained from the Project's Traffic Impact Assessment (TIA) (Amber, 2025), and are as follows:

TABLE 7-1 EXISTING ROAD TRAFFIC DATA

Parameter	Value
Posted speed limit	100 km/hr
Heavy vehicle traffic percentage	16.5%
Average Weekday traffic - 24hr	113 vehicles
Average Weekday traffic - Day (7am to 10pm)	~101 vehicles
Average Weekday traffic - Night (10pm to 7am)	~12 vehicles

Source: *Section 2.3* of the Project's Traffic Impact Assessment (Amber, 2025).

Overall, the data indicates Garoo Road currently accommodates a relatively low level of traffic for its road classification.

7.2 CONSTRUCTION TRAFFIC NOISE

As stated in the Project's TIA (Amber, 2025), the peak hour for construction traffic will occur at the start and end of the day when workers are transported to and from the Project area. Most workers will typically arrive on-site between 6am and 7am and depart between 5pm and 7pm. Workers generally have staggered finish times, which results in the evening peak hour being less pronounced.

The anticipated daily peak construction traffic volume provided in the TIA (Amber, 2025) are 108 light vehicles trips, 28 shuttle buses trips and 156 heavy vehicles trips. The anticipated peak construction traffic volume during peak hour are 54 light vehicles, 7 shuttle buses trips and 21 heavy vehicles.

For this road traffic noise assessment, it is assumed that during the night-time assessment period, all vehicle movements will occur between 6am to 7am corresponding to the peak hour traffic predicted data. During the day assessment period, it is assumed that the remaining vehicles will arrive and depart throughout the day from 7am to 7pm.

Noise sensitive receiver R3 (identified in **Appendix A**) along the road section on Garoo Road, is approximately 50m east of the road, north-east of the site, and is selected to be the assessment location. Among all the noise sensitive receivers, R3 is the most sensitive and has the highest potential to be affected by construction traffic noise.

The predicted construction traffic noise levels at R3 are shown in **Table 7-2**.

TABLE 7-2 PREDICTED CONSTRUCTION TRAFFIC NOISE LEVELS

Assessment Period	Existing Traffic			Project Traffic Volume		Existing + Project Traffic			RNP Criteria, dB(A)
	Traffic Volume		Predicted Traffic Noise Level, dB(A)			Traffic Volume		Predicted Traffic Noise Level, dB(A)	
	LV	HV		LV	HV	LV	HV		
Day (7am to 10pm)	84	17	L _{Aeq,15 hour} 42.5	68	78	152	95	L _{Aeq,15 hour} 48.6	L _{Aeq,15 hour} 60
Night (10pm to 7am)	10	2	L _{Aeq,9 hour} 37.2	68	78	78	80	L _{Aeq,9 hour} 51.5	L _{Aeq,9 hour} 55

Note:

A façade reflection of 2.5 dB has been applied to all calculated results as per the RNP (DECCW, 2011).

LV = Light Vehicles

HV = Heavy Vehicles

The predicted road traffic noise levels at Sensitive Receiver R3 indicate compliance with the day and night-time RNP criteria during the peak construction traffic period. The peak construction period is expected to last 10 months.

Although construction traffic noise impacts are predicted to be insignificant, general best practice road traffic noise control measures are provided in **Section 8.1.1**, to ensure noise impacts to residents and other noise sensitive receivers surrounding the site are minimised.

7.3 OPERATIONAL TRAFFIC NOISE

The Project's TIA (Amber, 2025) notes the following on operational traffic:

During operation, the BESS is expected to generate a minimal level of traffic associated with maintenance and operation services. The BESS is expected to be operated by between 5 and 10 maintenance personnel and occasional deliveries resulting in a traffic generation of up to 20 vehicle movements per day which would result in a negligible change to the traffic environment. There would also be occasional heavy vehicles delivering to the site but only as required for maintenance.

Based on the above, traffic noise impacts at sensitive receivers during the operational stage of the Project are expected to be negligible.

8. RECOMMENDATIONS

This section presents recommended construction and operational noise mitigation and management measures. All recommendations are based on the predicted noise levels and evaluation of the magnitude and extent of potential impacts identified in **Section 5.3** (for construction) and **Section 6.3** (for operation) of this report.

They are designed to ensure that, where feasible, reasonable, and practical to implement, construction and operational noise emissions are maintained within acceptable levels at all receivers. These recommendations also provide a general reassurance that suitable safeguards and provisions for monitoring are documented in this report to manage construction and operational noise.

8.1 CONSTRUCTION

Based on the findings presented in **Section 5.3**, the ICNG 'noise affected' management level is exceeded at 5 NSRs (R2a, R3, R4, R5, R2b) for construction scenarios CON 1, CON 2 and CON 3. The results were based on worst-case assumptions of construction activities at the Project boundary fronting sensitive receivers in the absence of any noise mitigation measures.

Although construction noise may be audible and there is likely to be some degree of adverse impact during sensitive periods (socialising or relaxing), as is typical with construction projects near residential receivers, by incorporating the noise control measures provided in this section, the noise impact to residents and other noise sensitive receivers surrounding the site can be managed.

The highest construction noise impact will be experienced for a short duration when activities are closest to the receivers. As the activities move further away from the receivers, the noise levels are expected to be lower to the predicted noise levels in **Table 5-2**.

The following construction noise control measures are recommended to enable compliance with the 'noise affected' management levels:

- Noise generating work and activities should be (as proposed) limited (where possible) to the ICNG recommended standard hours (i.e., 7am to 6pm Monday to Friday and 8am to 1pm Saturdays and no work on Sundays or public holidays);
- Where an equipment item (drum roller, the padfoot roller, the cranes, the small pile driving rigs, scraper and tub grinder/mulcher) operates close to the Project Boundary and these works are anticipated to generate high levels of noise e.g., > 45 dB(A) at a sensitive receiver as per **Table 5-2**, potential respite periods, e.g., three hours of work, followed by one hour of respite should be applied. Respite should be implemented if it is the preference of the affected receivers and if they are feasible and reasonable, and practical, to implement during the works. In some circumstances respite may extend the duration of works and inadvertently increase noise impacts; hence due care should be taken when considering this management measure;
- Appropriate plant, equipment and/or machinery for each task should be selected and efficient work practices to minimise the total construction period and the number of noise sources on the site should be adopted;
- Unnecessary noise due to idling engines should be avoided. High engine speeds should be avoided when equipment can be powered down and lower engine speeds are feasible;

- All plant, equipment and/or machinery used on the site should be in suitable condition, with particular emphasis on exhaust silencers, covers on engines and inspection of squeaking or rattling components. Excessive noise-generating machines should be repaired or removed from the site;
- Reversal alarms shall be replaced with broadband “squash duck” motion alarms, where feasible;
- If any validated noise complaints are received, operator attended noise validation and compliance measurements should be undertaken to measure and compare the site noise level contributions to the NMLs presented in this report. All site noise levels should be measured and quantified in the absence of any influential noise sources not associated with the Project. If the measured site noise levels are above the NMLs presented in this report, further mitigation and/or management measures should be considered;
- Unattended noise monitoring systems shall be established at selected worst-affected sensitive receivers depending on the different activities and stages of construction when such details are finalised. The results shall be used to improve the noise mitigation and management measures for the Project so that best practice noise control is continually implemented; and
- As per standard practice for any construction activities in NSW, a Construction Noise Management and Vibration Plan (CNVMP) containing noise mitigation and management measures shall be created for the construction phase of this Project. A Draft CNVMP is provided in **Appendix B**.

8.1.1 CONSTRUCTION ROAD TRAFFIC

Construction traffic noise management should be included in the CNVMP for the Project.

It is anticipated that this may include site awareness training and environmental inductions for construction and operation staff, highlighting driving practices to minimise traffic noise impacts on the sensitive receivers.

The following noise strategies to manage construction related traffic should also be considered:

- Consultation and notification:
 - Provide, reasonably ahead of time, information such as duration, what is being done to minimise noise and when respite periods will occur;
 - Provide information to neighbours before and during construction through media such as letterbox drops, meetings or individual contact. In some areas, the proponent will need to provide notification in languages other than English. A website could also be established for the project to provide information;
 - Use a site information board at the front of the site with the name of the organisation responsible for the site and their contact details, hours of operation and regular information updates. This signage should be clearly visible from the outside and include afterhours emergency contact details;
 - Maintain good communication between the community and project staff;
 - Appoint a community liaison officer where required;
 - Provide a toll-free contact phone number for enquiries during the works; and

- Facilitate contact with people to ensure that everyone can see that the site manager understands potential issues, that a planned approach is in place and that there is an ongoing commitment to minimise noise.
- Complaints handling:
 - Provide a readily accessible contact point, for example, through a 24-hour toll-free information and complaints line;
 - Give complaints a fair hearing;
 - Have a documented complaints process, including an escalation procedure so that if a complainant is not satisfied there is a clear path to follow;
 - Call back as soon as possible to keep people informed of action to be taken to address noise problems;
 - Provide a quick response to complaints, with complaint handling staff having both a good knowledge of the project and ready access to information;
 - Implement all feasible and reasonable measures to address the source of complaint; and
 - Keep a register of any complaints, including details of the complaint such as date, time, person receiving complaint, complainant's contact number, person referred to, description of the complaint, work area (for larger projects), time of verbal response and timeframe for written response where appropriate.
- Work scheduling:
 - Provide respite periods: Consult with affected residents to ensure that noise-generating construction works are acceptable at those times;
 - Organise work to be undertaken during the recommended standard hours where possible;
 - Schedule work when neighbours are not present;
 - Schedule noisy activities around times of high background noise (local road traffic or when other local noise sources are active) where possible to provide masking or to reduce the amount that the construction noise intrudes above the background;
 - Consult with affected neighbours about scheduling activities to minimise noise impacts; and
 - Where night work near residences cannot be feasibly or reasonably avoided, restrict the number of nights per week and/or the number of nights per calendar month that the works are undertaken, in consultation with residents who will be most affected.

8.2 OPERATION

Based on the assessment presented in **Section 6**, the predicted operational noise levels indicate compliance with the relevant PNTLs based on the modelled noise sources' assumptions presented in **Table 6-2**, and with the incorporation of the noise mitigation measures detailed in this section as part of the Project design.

8.2.1 NOISE REDUCTION KITS AND SILENCER KITS

Noise reduction kits and silencer kits will be installed for the following plant items as part of the Project Design:

- All inverters located in-between PV module structures – A Sound Power Level of 83.2 dB(A) is to be achieved for each plant item;
- All BESS Battery Units – A Sound Power Level of 78.8 dB(A) is to be achieved for each plant item; and
- All PCS Stations – A Sound Power Level of 85.9 dB(A) is to be achieved for each plant item.

8.2.2 NOISE WALLS

At-path noise mitigation measures, in the form of noise walls, will be incorporated into the Project design. A total of 45 noise walls are required, with the following configuration:

- 4.0 m high L-shaped noise walls at 42 PCS Stations as identified and shown in **Figure 8-1**; and
- 8.0 m high C-shaped noise walls at 3 high voltage transformers as identified and shown in **Figure 8-2**.

Details of the lengths and configurations of the noise walls are provided in their respective figures.

The above-mentioned noise walls shall meet the following requirements:

- A solid construction with no gaps between panels or ground-panel interfaces and a surface density of at least 20 kg/m², or a construction that has a sound insulation rating value of $R_w + C_{tr}$ of at least 25 dB as determined by a NATA accredited laboratory; and
- Air-flow requirements for the inverters shall be considered and advice should be sought from the equipment manufacturers on the necessary gap between the inverter and the noise wall. A 1.0 m separation distance has been assumed in the modelling of the noise walls at inverters.

An example of a typical noise wall is shown below:

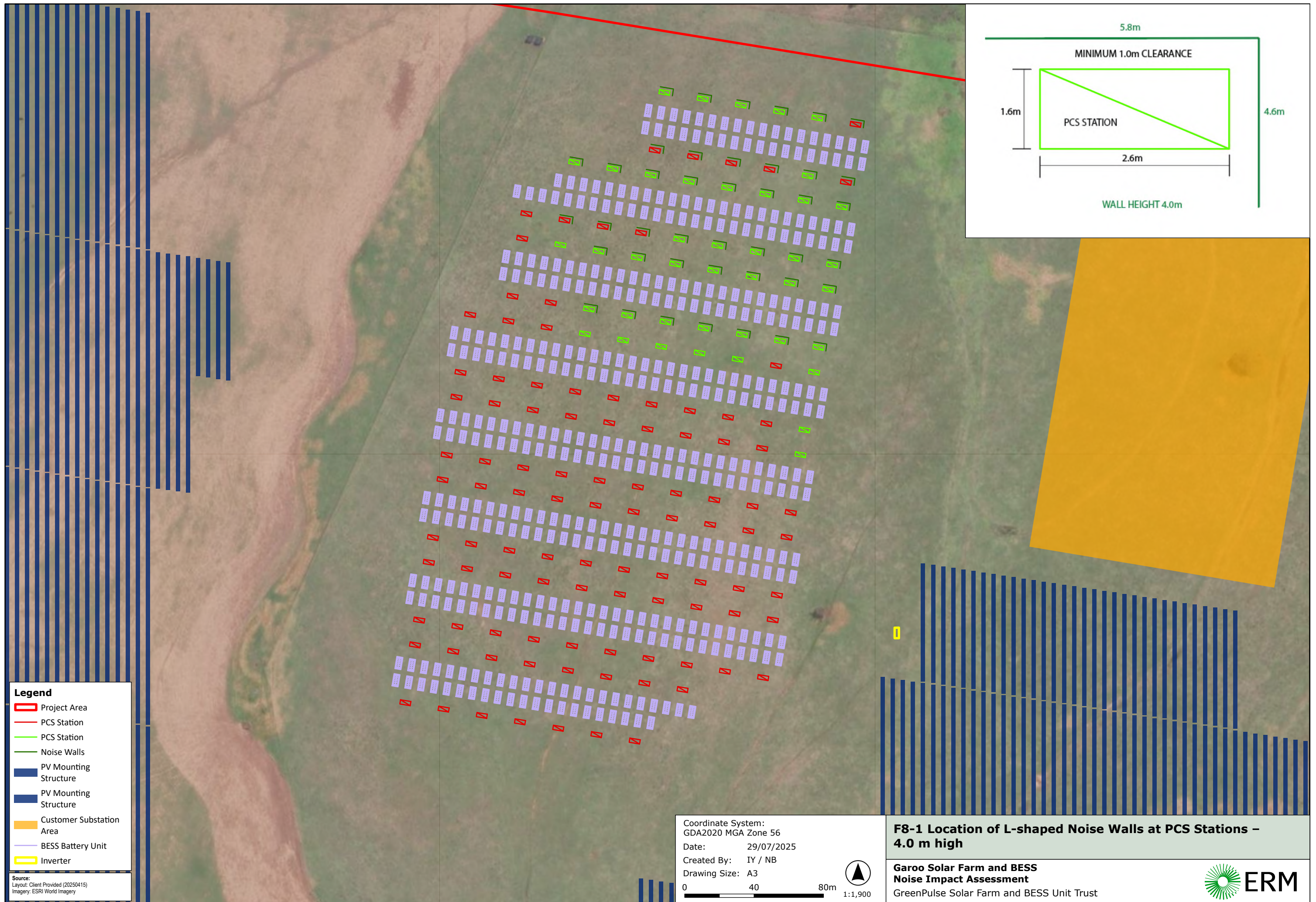


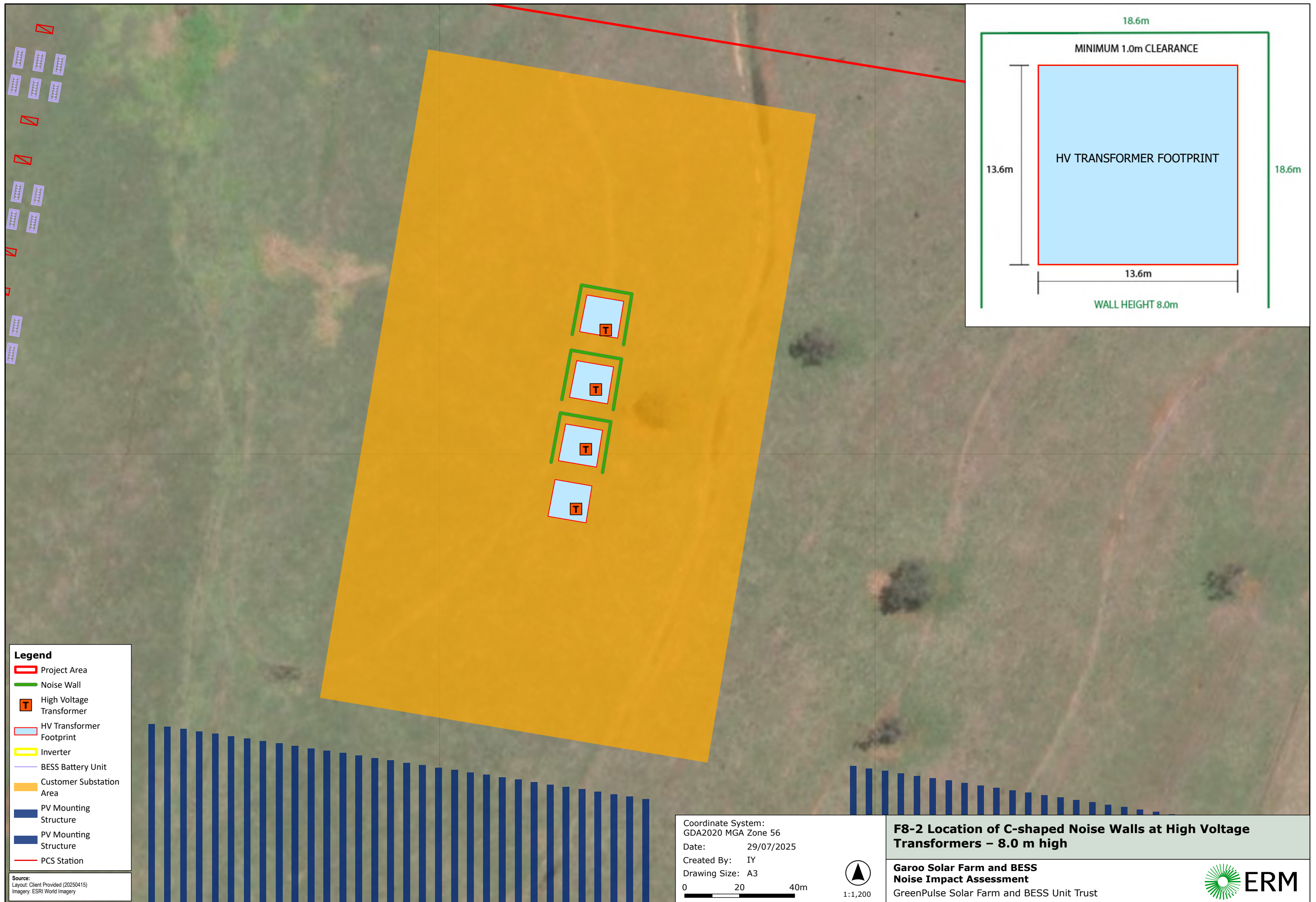
Source: Acoustiblok Website (<https://acoustiblok.com/power-generation-noise-reduction/>)

It should be noted that bunding may replace the recommended noise walls if the effective height of the bund matches the height of the noise walls, sufficient area in the disturbance footprint is available and equipment air flow requirements are met.

It should be noted that the noise mitigation measures presented are subject to change during detailed design. Opportunities for other mitigation strategies through technology selection, localised equipment noise control among other options with equivalent or improved noise impact mitigation performance shall be considered in the detailed design phase.

Equipment selection and quantity are to adhere to the SWL per plant item and quantity specified in the assessment. Should the SWL, location or quantity of the selected equipment change significantly, this assessment should be revised to incorporate the changes in design.





- Legend**
- Project Area
 - Noise Wall
 - High Voltage Transformer
 - HV Transformer Footprint
 - Inverter
 - BESS Battery Unit
 - Customer Substation Area
 - PV Mounting Structure
 - PV Mounting Structure
 - PCS Station

Source:
Layout: Client Provided (20250415)
Imagery: ESRI World Imagery

Coordinate System:
GDA2020 MGA Zone 56
Date: 29/07/2025
Created By: IY
Drawing Size: A3
0 20 40m
1:1,200

F8-2 Location of C-shaped Noise Walls at High Voltage Transformers – 8.0 m high

**Garoo Solar Farm and BESS
Noise Impact Assessment**
GreenPulse Solar Farm and BESS Unit Trust



9. CONCLUSION

This NIA has assessed potential construction and operational noise impacts associated with the Garoo Solar Farm and BESS for GreenPulse Solar Farm and BESS Unit Trust.

The existing noise environment at identified NSRs was established, and construction and operational noise management levels and assessment criteria were developed in accordance with the relevant NSW standards and guidelines, namely the NPI, ICNG and the RNP.

Applicable worst-case construction and operational assessment scenarios were developed based on project information outlined in this report. Construction and operational noise levels were predicted and compared to the established noise management levels and criteria to evaluate compliance.

The construction noise assessment concluded that the ICNG 'noise affected' management level is exceeded at 5 sensitive receivers (R2a, R3, R4, R5, R2b) for construction scenarios CON 1, CON 2 and CON 3 as defined in Section 5. The results were based on worst-case assumptions of construction activities at the Project boundary fronting sensitive receivers in the absence of any noise mitigation measures. However, no exceedance of the ICNG 'highly noise affected' management level at any of the sensitive receivers is expected during construction. Noise management and mitigation measures will be required to be implemented in the CNVMP for the Project.

No exceedance of the ICNG 'noise affected' management level during outside recommended standard hours (OOH) is expected from the temporary workers' accommodation camp.

The operational noise assessment concluded that with the incorporation of noise mitigation measures, all the identified sensitive receivers within 2 km of the Project boundary are predicted to achieve compliance with the NPI PNTLs. The applicable noise mitigation measures are:

- at-source measures – Installation of noise reduction kits and silencer kits for all inverters located in-between PV module structures, all BESS Battery Units and all PCS Stations as detailed in **Table 6-2**; and
- at-path measures – 45 noise walls, with the following configuration:
 - 4.0 m high L-shaped noise walls at 42 PCS Stations as identified and shown in **Figure 8-1**; and
 - 8.0 m high C-shaped noise walls at 3 high voltage transformers as identified and shown in **Figure 8-2**.

The nearest developments to the identified NSRs are Middlebrook Solar Farm and BESS, and Lambruk Solar Farm which are located more than 20 km away from this Project. Their contribution to cumulative noise are expected to be insignificant at the nearest NSRs to this Project.

Opportunities for other mitigation strategies through technology selection, localised equipment noise control among other options with equivalent or improved noise impact mitigation performance may be considered in the detailed design phase.

Equipment selection and quantity are to adhere to the SWL per plant item and quantity specified in the assessment. Should the SWL, location or quantity of the selected equipment change significantly, this assessment should be reviewed to incorporate the changes in design.

Construction and operational traffic noise impacts arising from additional traffic associated with the Project have been assessed. Construction and operational road traffic impacts are not expected at all sensitive receivers in accordance with the assessment methodology and criteria outlined in the RNP.

10. REFERENCES

- Amber. (2025). Garoo Solar Farm and BESS, Garoo Road, Garoo - Traffic Impact Assessment (Report Ref.: 1056 rep 251030 final, dated 30 October 2025).
- DECC. (2009). NSW Department of Environment & Climate Change (DECC) (now NSW Department of Climate Change, Energy, the Environment and Water [DCCEEW]), Interim Construction Noise Guideline (ICNG).
- DECCW. (2011). NSW Department of Environment, Climate Change and Water (DECCW) (now NSW Department of Climate Change, Energy, the Environment and Water [DCCEEW]), Road Noise Policy (RNP).
- EPA. (2017). NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI).
- Manning, C. J. (1981). The Propagation of Noise from Petroleum and Petrochemical Complexes to Neighbouring Communities, CONCAWE Report No. 4/81.
- Standards Australia. (2010). AS 2436 Guide to noise and vibration control on construction, demolition and maintenance sites.
- TfNSW. (2016). Construction Noise and Vibration Guideline .
- TfNSW. (2016). Construction Noise Strategy 7TP-ST-157/3.0.



APPENDIX A NOISE SENSITIVE RECEIVERS

Sensitive Receiver ID	Type of Property	GPS Co-ordinates (UTM Zone 56J, in metres)		Distance to Project Boundary, in metres
		Easting	Northing	
R2a	Residential	301090	6519936	271
R3	Residential	303518	6521459	312
R4	Residential	299637	6520062	383
R5	Residential	303067	6521774	551
R6	Residential	299047	6521932	1530
R7	Residential	301994	6523532	2122
R8	Residential	305418	6520150	1859
R9	Residential	298570	6521612	1572
R10	Residential	304185	6523313	2256
R11	Residential	298562	6522791	2517
R12	Residential	305038	6517707	2834
R13	Residential	300222	6524554	3098
R14	Residential	298682	6523711	3140
R15	Residential	304823	6524174	3263
R16	Residential	300843	6525763	4220
R17	Residential	301982	6525702	4265
R18	Residential	304078	6525737	4625
R19	Residential	299322	6526034	4777
R2b	Residential	301029	6520057	163



APPENDIX B DRAFT CONSTRUCTION NOISE AND
VIBRATION MANAGEMENT PLAN

B1. INTRODUCTION

As per the project-specific Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning and Environment (DPE) (SSD-79747209, dated 4 March 2025), a Draft Construction Noise and Vibration Management Plan (CNVMP) has been prepared in advance of the detailed design, to demonstrate the framework for noise management during construction of the Project.

The Draft CNVMP will be updated prior to implementation and summarises the noise mitigation measures that can provide feasible and reasonable controls to reduce noise impacts at Sensitive Receivers.

The content of this Draft CNVMP has been duplicated from the sections relevant to construction noise from the main report.

B2. EXISTING NOISE ENVIRONMENT AND SENSITIVE RECEIVERS

The noise environment in the vicinity of the Project and at noise sensitive receivers is best described as rural residential. Rural residential is described in the NSW Environment Protection Authority (EPA), *Noise Policy for Industry* (NPI), as an area with an acoustical environment that is dominated by natural sounds (such as foliage noise, birdsong and insect noise) having little or no road traffic noise (from Denman Road) and is generally characterised by low background noise levels. Settlement patterns (rural residential) would be typically sparse.

The background noise levels at the nearest Sensitive Receivers to the Project are expected to be similar to the minimum assumed Rating Background Levels (RBLs) specified in Table 2.1 of NPI. The use of minimum assumed RBLs is reasonable in rural environments where there are no prominent noise sources associated with roads, rail and industrial plant influencing the noise environment at the receivers.

The nearest sensitive receivers within 2 km of the Project boundary have previously been identified above in **Appendix A**.

B3. NSW INTERIM CONSTRUCTION NOISE GUIDELINE

The Interim Construction Noise Guideline (ICNG) presents an accepted method to assess construction noise impacts for a range of receiver types. It provides a set of recommended standard hours of construction, specifically:

- Monday to Friday: 7am to 6pm;
- Saturday: 8am to 1pm; and
- No work on Sundays or public holidays.

Construction outside these hours might be undertaken in accordance with the ICNG for the following categories of work:

- The delivery of oversized plant or structures that police or other authorities determine require special arrangements to transport along public roads;
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm; and

- Works where a proponent demonstrates and justifies a need to operate outside the recommended standard hours.

The ICNG encourages works to occur within the recommended standard hours of construction unless justification is provided. It focuses on minimising noise by managing construction noise impacts, rather than only on achieving numeric noise levels, and recognises that some noise from construction sites is inevitable.

The ICNG encourages organisations involved with construction, maintenance or upgrading works (e.g., large scale contractors or Government agencies) to develop best-practice techniques for managing construction noise and vibration and implementing feasible and reasonable mitigation measures.

The ICNG is suitable to quantitatively assess potential noise emissions and impacts associated with Project construction. The ICNG assessment methodology has been adopted to develop project-specific construction noise management levels, assess potential impacts, and recommend any necessary mitigation, management measures.

Table B3-1 details the ICNG construction noise management levels guidance for residential receivers.

TABLE B3-1 CONSTRUCTION NOISE MANAGEMENT LEVELS FOR RESIDENTIAL RECEIVERS

Time of day	Management Level, $L_{eq, 15min}$, dB(A)	How to apply
Recommended standard hours (SH): - Monday to Friday: 7am to 6pm; - Saturday: 8am to 1pm; and - No work on Sundays or public holidays.	Noise affected Rating Background Level (RBL) + 10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{eq, 15 \text{ minute}}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be a strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, considering: - Times identified by the community when they are less sensitive to noise (e.g., before and after school for works near schools); - Mid-morning or mid-afternoon for works near residences; and - If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours (OOH): All other times including Public Holidays	Noise affected Rating Background Level (RBL) + 5 dB(A)	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the ICNG.

B4. CONSTRUCTION NOISE MANAGEMENT LEVELS

Construction works are expected to occur only the recommended standard daytime hours. The project-specific construction noise management levels (NMLs), for works within the recommended standard hours for construction, are presented in **Table B4-1** below.

These NMLs have been established with due regard to the requirements of the ICNG for all identified residential and other sensitive non-residential receivers.

For this assessment, noise monitoring was not conducted and instead the minimum RBLs as stated in the NPI were applied. This provides a conservative construction noise assessment for the Project.

TABLE B4-1 CONSTRUCTION NOISE MANAGEMENT LEVELS

Receiver Type and Time of Day	Daytime Rating Background Level (RBL), dB(A)	Noise Affected Management Level, $L_{eq}(15 \text{ min})$, dB(A)	Highly Noise Affected Management Level, $L_{eq}(15 \text{ min})$, dB(A)
Residence - Recommended Standard Hours	35	45	75

B5. CONSTRUCTION NOISE ASSESSMENT

B5.1 MODELLING METHODOLOGY

Conservative predictions of construction noise have been established through the calculation of the geometrical dispersion of noise with the assumption of flat topography, no acoustic shielding and no ground absorption effects.

The noise predictions consider the sound power level of the equipment operating continuously for a 15-minute period. It should be noted that the construction noise levels at any receiver depend on the type and duration of construction activity being undertaken and are expected to be variable over the total construction program.

Under a worst-case noise scenario, the construction noise sources are assumed to be at the boundary of the site fronting the nearest sensitive receivers, representing the shortest separation distance between noise source and receiver.

B5.2 CONSTRUCTION NOISE SOURCES

The following typical construction noise sources and their sound power levels are anticipated for the project and are listed in **Table B5-1**.

TABLE B5-1 CONSTRUCTION NOISE SOURCES

Equipment	Sound Power Level per unit, dB(A)*
Small Pile Driving Rig	114
Crane	110
Drum Roller	109
Padfoot Roller	109
Wheeled Loader	109
Dump Truck	108
Excavator	107
Bulldozer	108
Scraper	116
Grader	107
Chain Trencher	104
Water Truck	104
Telehandler	98
Forklift	90
Tub Grinder/ Mulcher 40-50 hp	116

Note: *The sound power levels provided in the above table are based on AS 2436:2010 (Standards Australia, 2010) and the Transport for New South Wales Construction Noise and Vibration Guideline (TfNSW, 2016).

The following worst-case construction noise scenarios were assessed:

1. **CON 1** - Site preparation and establishment - A drum roller and a padfoot roller at the site's boundary fronting a sensitive receiver and operating continuously for 15 minutes;
2. **CON 2** - Delivery of infrastructure – Two cranes at the site's boundary fronting a sensitive receiver and operating continuously for 15 minutes; and
3. **CON 3** - General construction of infrastructure – Two small pile driving rigs at the site's boundary fronting a sensitive receiver and operating continuously for 15 minutes.

B5.3 PREDICTED CONSTRUCTION NOISE LEVELS

Predicted worst-case and unmitigated $L_{Aeq,15min}$ noise levels for all individual construction machinery/equipment and above-mentioned construction scenarios at the nearest sensitive receivers (within 2 km of the site's boundary where construction noise impacts may be present) have been presented in **Table B5-2**.

The following findings have been summarised from the results:

- The ICNG 'noise affected' management level is exceeded at:
 - 5 Sensitive Receivers (R2a, R3, R4, R5, R2b) for construction scenarios CON 1, CON 2 and CON 3.
- No exceedance of the ICNG 'highly affected' management level at any of the sensitive receivers is expected for all construction scenarios; and
- The main noise contributors are the drum roller, the padfoot roller, the cranes and the small pile driving rigs, as defined in the worst-case construction noise scenarios.

It should be noted that the predicted noise levels and the duration of any exceedances are variable due to the intermittent operation of construction equipment and the changing separation distances between mobile construction noise sources and sensitive receivers.

TABLE B5-2 PREDICTED CONSTRUCTION NOISE LEVELS

Sensitive Receiver ID	Equipment ^a															Scenario ^b		
	Small pile driving rig	Crane	Drum roller	Padfoot roller	Wheeled loader	Dump truck	Excavator	Bulldozer	Scraper	Grader	Chain trencher	Water truck	Telehandler	Forklift	Tub Grinder/Mulcher	CON 1	CON 2	CON 3
R2b	62	58	57	57	57	56	55	56	64	55	52	52	46	38	64	60	61	65
R2a	57	53	52	52	52	51	50	51	59	50	47	47	41	33	59	55	56	60
R3	56	52	51	51	51	50	49	50	58	49	46	46	40	32	58	54	55	59
R4	54	50	49	49	49	48	47	48	56	47	44	44	38	30	56	52	53	57
R5	51	47	46	46	46	45	44	45	53	44	41	41	35	27	53	49	50	54
R6	42	38	37	37	37	36	35	36	44	35	32	32	26	18	44	40	41	45
R9	42	38	37	37	37	36	35	36	44	35	32	32	26	18	44	40	41	45
R8	41	37	36	36	36	35	34	35	43	34	31	31	25	17	43	39	40	44

Notes:

The Noise Affected Management Level is $L_{Aeq(15 \text{ min})}$ 45 dB(A), and the Highly Noise Affected Management Level is $L_{Aeq(15 \text{ min})}$ 75 dB(A)

Noise Affected Management Level exceedances are shown in **bold** font. Important to note that these exceedances are only when the specific machinery is operating, or stated construction scenario is occurring.

^a Predicted noise levels for equipment are for the operation of a single equipment item at the Solar Farm boundary fronting each assessed Sensitive Receiver

^b Construction scenarios CON 1, CON 2 and CON 3 are defined above.

B6. CONSTRUCTION VIBRATION – SAFE WORKING DISTANCES

Safe working distances for vibration causing plant, which may be used during the construction activities, have been taken from the Transport for New South Wales Construction Noise Strategy (TfNSW, 2016) and are summarised in **Table B6-1**.

TABLE B6-1 RECOMMENDED SAFE WORKING DISTANCES

Plant Item	Rating/Description	Safe Working Distance, in metres	
		Cosmetic Damage (BS 7385. ¹)	Human Response (AS 2670)
Vibratory Roller	<50kN (1-2t)	5	15 to 20
Vibratory Roller	<100kN (2-4t)	6	20
Vibratory Roller	<200kN (4-6t)	12	40
Vibratory Roller	<300kN (7-13t)	15	100
Small Hydraulic Hammer	300kg – 5 to 12t excavator	2	7
Medium Hydraulic Hammer	900kg – 12 to 18t excavator	7	23

The safe working distances for typical vibration causing plant in construction range from 7 to 100 metres to trigger a human response. There is no vibration sensitive receiver within this range and therefore vibration impacts are not expected from the project.

B7. CONSTRUCTION TRAFFIC NOISE

As stated in the Project's Traffic Impact Assessment, the peak hour for construction traffic will occur at the start and end of the day when workers are transported to/from the Project area. Most workers will typically arrive on-site between 6am and 7am and depart between 5pm and 7pm. Workers generally have staggered finish times which results in the evening peak hour being less pronounced.

The predicted daily peak construction traffic volume provided in the Project's Traffic Impact Assessment are 108 light vehicles trips, 28 shuttle buses trips and 156 heavy vehicles trips. The anticipated peak construction traffic volume during peak hour are 54 light vehicles, 7 shuttle buses trips and 21 heavy vehicles.

For this road traffic noise assessment, it is assumed that during the night-time assessment period, all vehicle movements will occur between 6am to 7am corresponding to the peak hour traffic predicted data. During the day assessment period, it is assumed that the remaining vehicles will arrive and depart throughout the day from 7am to 7pm.

Noise sensitive receiver R3 along the road section on Garoo Road, is approximately 50m east of the road, north-east of the site, and is selected to be the assessment location. Among all the noise sensitive receivers, R3 is the most sensitive and has the highest potential to be affected by construction traffic noise.

The predicted construction traffic noise levels at R3 are shown in **Table B7-1**.

¹ BS 7385 -2: 1993 Guide to damage levels from ground borne vibration

TABLE B7-1 PREDICTED CONSTRUCTION TRAFFIC NOISE LEVELS

Assessment Period	Existing Traffic			Project Traffic Volume		Existing + Project Traffic			RNP Criteria, dB(A)
	Traffic Volume		Predicted Traffic Noise Level, dB(A)			Traffic Volume		Predicted Traffic Noise Level, dB(A)	
	LV	HV		LV	HV	LV	HV		
Day (7am to 10pm)	84	17	L _{Aeq,15 hour} 42.5	68	78	152	95	L _{Aeq,15 hour} 48.6	L _{Aeq,15 hour} 60
Night (10pm to 7am)	10	2	L _{Aeq,9 hour} 37.2	68	78	78	80	L _{Aeq,9 hour} 51.5	L _{Aeq,9 hour} 55

Note:

A façade reflection of 2.5 dB has been applied to all calculated results as per the RNP (DECCW, 2011).

LV = Light Vehicles

HV = Heavy Vehicles

The predicted road traffic noise levels at Sensitive Receiver R3 indicate compliance with the day and night-time RNP criteria during the peak construction traffic period. The peak construction period is expected to last 10 months.

Although construction traffic noise impacts are predicted to be insignificant, general best practice noise control measures are provided below, to ensure noise impacts to residents and other noise sensitive receivers surrounding the site are minimised.

B8. NOISE MITIGATION MEASURES

Based on the findings presented in this report, the ICNG 'noise affected' management level is exceeded at 5 NSRs (R2a, R3, R4, R5, R2b) for construction scenarios CON 1, CON 2 and CON 3. The results were based on worst-case assumptions of construction activities at the Project boundary fronting sensitive receivers in the absence of any noise mitigation measures.

Although construction noise may be audible and there is likely to be some degree of adverse impact during sensitive periods (socialising or relaxing), as is typical with construction projects near residential receivers, by incorporating the noise control measures provided in this section, the noise impact to residents and other noise sensitive receivers surrounding the site can be managed.

A CNVMP would generally follow the approach in the Interim Construction Noise Guideline (ICNG), including the strategies to manage noise provided in '*Appendix C Audible alarms on mobile plant*' of the ICNG.

Table B8-1 summarises the mitigation measures to be implemented during the construction of the Project.

TABLE B8-1 NOISE MITIGATION MEASURES

Subject	Measures Summary
Scheduling	Works should be undertaken during standard working hours only, as specified in the ICNG (DECC, 2009): - Monday to Friday: 7am to 6pm; - Saturday: 8am to 1pm; and - No work on Sundays or public holidays. Construction outside these hours might be undertaken as follows: - In accordance with the ICNG; - For activities that are inaudible at Non-associated dwellings (dwellings without an agreement with The Applicant with respect to the management of noise for the Project); and - With agreement by DPHI. Where an equipment item operates close to the Project Boundary, or where noise level exceedances cannot be avoided (generate high levels of noise e.g., > 45 dB(A) at a Sensitive Receiver), then consideration may be given to implementing time restrictions and/or providing periods of respite for affected receivers, where feasible and reasonable. In some circumstances respite may extend the duration of works and inadvertently increase noise impacts; hence due care should be taken when considering this management measure.
Equipment	- Selection of the quietest plant, equipment and/or machinery for each construction activity, where practicable; - Efficient work practices to minimise the total construction period and the number of noise sources onsite should be adopted; - Unnecessary noise due to idling engines should be avoided; - High engine speeds should be avoided when equipment can be powered down and lower engine speeds are feasible; - All plant, equipment and/or machinery used onsite should be in suitable condition, with particular emphasis on exhaust silencers, covers on engines and inspection of squeaking or rattling components. Excessive noise-generating machines should be repaired or removed from the site; - Reversal alarms shall be replaced with broadband "squash duck" motion alarms, where feasible;

Subject	Measures Summary
	- Any equipment not in use for extended periods during construction should be turned off; - Vehicles and equipment should be regularly serviced according to manufacturers' instructions and maintained in proper working order; - Simultaneous operation of noisy equipment should be avoided where practical; and - Where practical, noisy equipment should be positioned behind structures that act as barriers to sensitive receivers, or at the greatest distance from sensitive receivers, or oriented to directed noise emissions away from sensitive receivers.
Training	All construction workforce should receive inductions prior to commencing on site. Inductions may occur via toolbox meetings, training and/or education, and should inform staff of: - Procedures to operate plant and equipment in a quiet and efficient manner; - Location of nearest sensitive receivers; - Standard construction hours; - Relevant approval conditions; and - Incidents and complaints handling procedures.
Sensitive receivers consultation	Affected sensitive receivers should be consulted with prior to the commencement of works that are expected to exceed noise criteria. Consultation activities should discuss: - The details of proposed works; - The anticipated noise impacts; - The time periods over which these works would occur; and - To identify any management measures required to minimise impact at affected sensitive receivers.

B9. COMPLIANCE MANAGEMENT

B9.1 COMPLAINTS

Any complaints received from the community regarding noise should be addressed in accordance with the complaints handling procedures (to be developed at a later stage) to be provided for the Project.

If any validated noise complaints are received from the community, attended noise compliance measurements should be undertaken to measure and compare the site noise level contributions to the NMLs presented in this report.

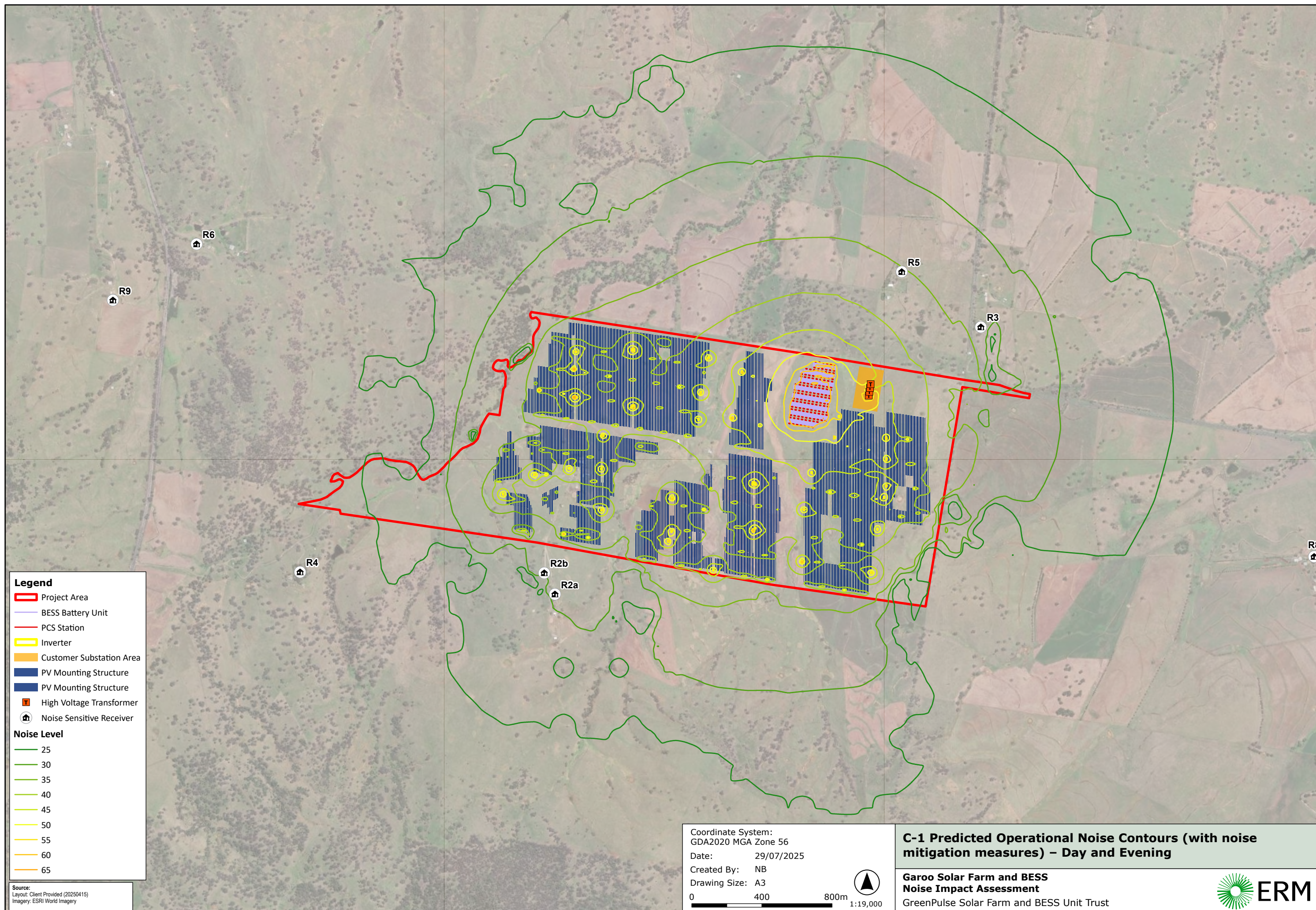
All site noise levels should be measured and quantified in the absence of any influential noise sources not associated with the Project. If the measured site noise levels are above the NMLs presented in this report, further mitigation and/or management measures should be considered.

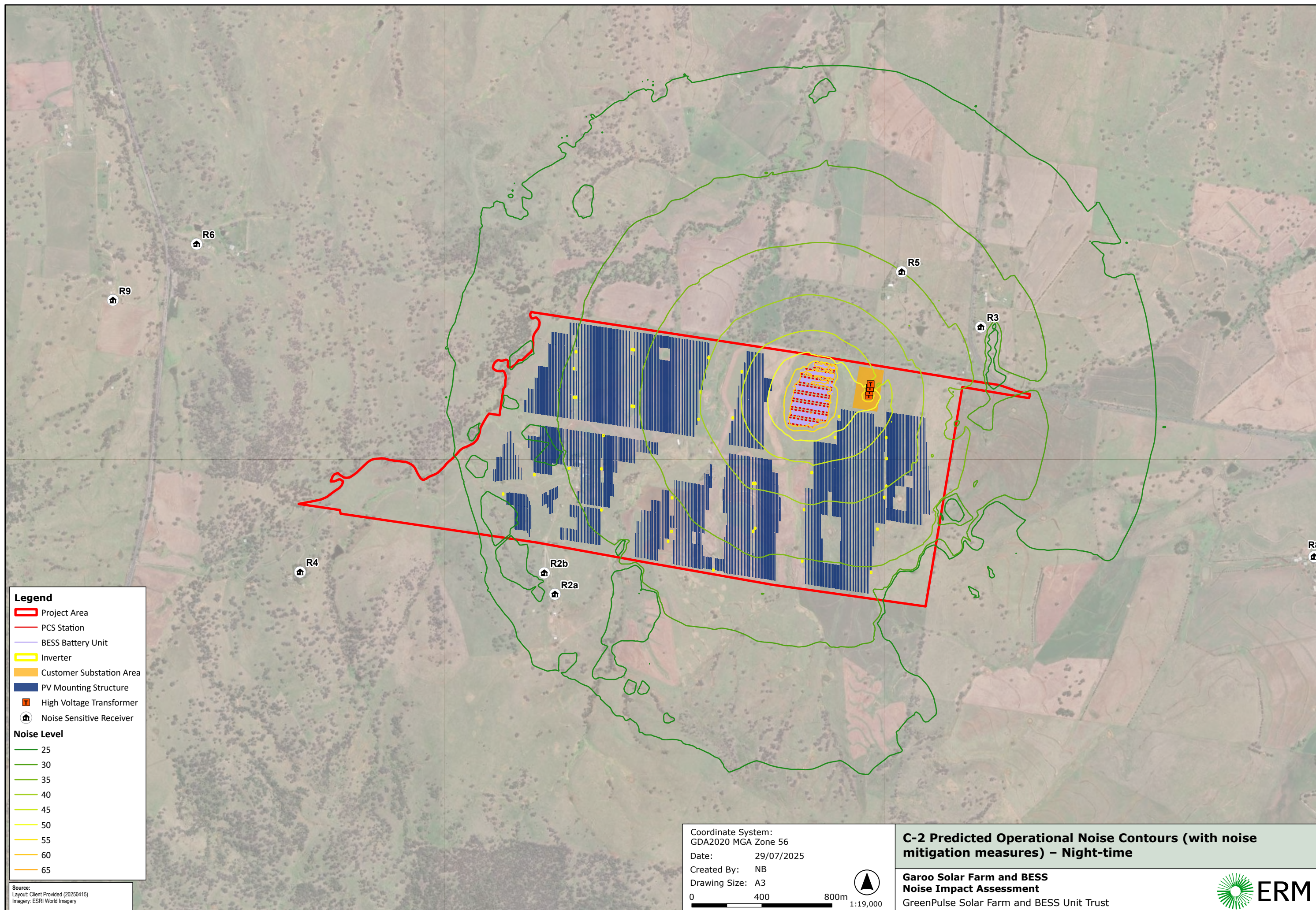
B9.2 MONITORING AND REPORTING

Unattended noise monitoring systems should be established at selected worst-affected sensitive receivers depending on the different activities and stages of construction when such details are finalised. The results should be used to improve the noise mitigation and management measures for the Project so that best practice noise control is continually implemented.



APPENDIX C OPERATIONAL NOISE CONTOURS







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